



Washington State
Department of Transportation



I-90 Snoqualmie Pass East

I-90 Snoqualmie Pass East

Avalanche Structures Draft Supplemental Environmental Impact Statement



U.S. Department of Transportation
**Federal Highway
Administration**

Draft Supplemental EIS

October 2012



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Interstate 90 Snoqualmie Pass East
Kittitas County, Washington
Avalanche Structures Draft Supplemental Environmental Impact Statement
Submitted Pursuant to 42 USC 4332(2)(C) (and where applicable 49 USC 303)
by the
US Department of Transportation
Federal Highway Administration
and
Washington State Department of Transportation
Cooperating Agencies include: United States Forest Service
and
United States Bureau of Reclamation

9/27/2012
Date of Approval

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9/27/2012
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In accordance with the National Environmental Policy Act and Washington State Environmental Policy Act, the Interstate 90 (I-90) Snoqualmie Pass East, Avalanche Structures Draft Supplemental Environmental Impact Statement (EIS) evaluates environmental conditions between milepost 57.9 and 58.4 of I-90 in Kittitas County, Washington. The Washington State Department of Transportation is evaluating a design modification to construct eastbound and westbound avalanche bridges in place of an expanded snowshed that was originally part of the I-90 Snoqualmie Pass East Project (I-90 project) Selected Alternative. This design modification is being considered because it would result in long-term operations and maintenance cost savings for the state. Both options meet project needs (avalanches, slope instability, structural deficiencies, traffic volumes, and ecological connectivity) and each option has distinct benefits and impacts presented in this Draft Supplemental EIS. Comments on this document are due by November 19, 2012, and should be sent to Jason Smith at the above address. Additional single copies of this document may also be obtained free of charge by contacting Jason Smith.

Fact Sheet

Project Name:

I-90 Snoqualmie Pass East Project

Project Description:

The Federal Highway Administration (FHWA) and the Washington State Department of Transportation (WSDOT) prepared a 2005 Draft Environmental Impact Statement (EIS) and a 2008 Final EIS for proposed improvements to a 15-mile portion of Interstate 90 (I-90) immediately east of Snoqualmie Pass in the Cascade Mountains, from Hyak at milepost (MP) 55.1 to Easton Hill at MP 70.3. Consistent with National Environmental Policy Act (NEPA) regulations, the Forest Service (Department of Agriculture) and Bureau of Reclamation (Department of Interior) were cooperating agencies in preparing these documents. Following the 2008 Record of Decision (ROD) by FHWA and concurrence from the cooperating agencies, WSDOT proceeded with implementation of the Selected Alternative and construction of the I-90 project has continued since 2009.

In fall 2011, the contractor constructing the portion of the I-90 project that encompasses the snowshed along Keechelus Lake (Existing Snowshed) proposed a design modification that would replace the Existing Snowshed with eastbound and westbound avalanche bridges (Proposed Bridges) instead of the expanded snowshed included in the Selected Alternative (Selected Snowshed). FHWA and WSDOT prepared this Avalanche Structures Draft Supplemental EIS (Supplemental EIS) to compare and contrast the benefits and impacts of constructing, maintaining, and operating the Proposed Bridges instead of the Selected Snowshed.

FHWA and WSDOT will decide which option to construct based on the results of this Supplemental EIS. Both design options meet the I-90 project purpose and need, cost about the same to construct, occupy roughly the same footprint, and result in similar impacts to natural resources. Therefore, the basis for a decision rests on the cost of long-term maintenance and operation. The Selected Snowshed would minimize the need for highway closures due to avalanches,

avalanche control, and rock fall. However, this enclosed structure requires fire and life-safety systems that are expensive to operate and maintain. The Proposed Bridges would provide comparable avalanche and rock fall protection and avoid the need for fire and life-safety systems. As a result, the Proposed Bridges would save the state approximately \$48 million in operations and maintenance costs over the next 75 years.

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This Draft Supplemental EIS was prepared under the direction of the WSDOT South Central Region Environmental Office. Research and analysis was performed by numerous individuals listed in Chapter 7.

Date Document Issued:

October 5, 2012

Date Draft Supplemental EIS Comments are Due:

November 19, 2012

Public Hearings:

October 23, 2012	October 24, 2012	October 25, 2012
4:00 to 7:00 p.m.		
Lewis Creek Visitors Center 5808 Lakemont Boulevard SE Bellevue, WA 98006	Summit Inn 603 State Route 906 Snoqualmie Pass, WA 98068	Hal Holmes Community Center 209 N Ruby Street Ellensburg, WA 98926

Projected Date of Issue of Final Supplemental EIS:

The Final Supplemental EIS is expected to be circulated in early 2013.

Document Cost and Availability:

The Draft Supplemental EIS is available on the I-90 project web site:
www.wsdot.wa.gov/Projects/I90/SnoqualmiePassEast

A limited number of hard copies or DVDs may also be obtained free of charge by contacting:

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Paper copies of the Draft Supplemental EIS are available for review at King County libraries (Bellevue Regional, Issaquah, Lake Hills, Newport Way, North Bend), Ellensburg Library, Cle Elum Library, Central Washington University Library, Seattle Public Library (Downtown Branch only), and the Washington State Library.

Permits and Approvals:

Highway improvements are subject to federal, state, and local permit processes. If FHWA and WSDOT select the Proposed Bridges in the ROD, the approvals and permits listed below would require modification or amendment prior to construction. The Selected Snowshed is already permitted and approved. WSDOT intends to

proceed with construction of the Selected Snowshed if the Proposed Bridges are not selected in the ROD in spring 2013.

Permits and Approvals for the Proposed Bridges

Agency	Statute	Permit/Approval
Federal		
US Fish and Wildlife Service/National Oceanic and Atmospheric Administration Fisheries	Endangered Species Act Section 7 consultation and concurrence (impact to listed species) Migratory Bird Treaty Act	Consultation and Biological Opinion (<i>re-initiation of consultation based on new design information</i>)
US Army Corps of Engineers	Clean Water Act	Section 404 Individual Permit (<i>regulatory update and/or reissuance</i>)
US Forest Service	Acquisition of Rights-of-Way – Interstate System [Title 23 US Code 107(d)]	Consistency determination with the US Forest Service Forest Plan(s) (<i>review and update</i>)
US Forest Service	Organic Act of 1897, National Forest Management Act of 1976	Access Permit(s) and Special Use Permit(s) (<i>review and update</i>)
US Bureau of Reclamation	Use of Bureau of Reclamation Land, Facilities, and Waterbodies (Title 43 CFR Part 423) Reclamation Act of 1902 (Public Law 57-161) Reclamation Reform Act of 1982 (Title II of Public Law 97-293)	Use Authorization (<i>review and update</i>) US Forest Service Permit(s) (<i>review and concur</i>)
State		
Washington State Department of Ecology	Clean Water Act Section 401	Water Quality Certification (<i>modification</i>)
Washington State Department of Ecology	Shoreline Management Act (RCW 90.58)	Consider administrative appeals
Washington Department of Fish and Wildlife	Construction Projects in State Waters (RCW 77.55)	Hydraulic Project Approval (<i>modification</i>)
Local		
Kittitas County	County Code (Title 17 and 18) and Shoreline Management Act (RCW 90.58)	Substantial Development Permit(s) and/or exemption, Critical Areas Ordinance review, and limited zoning review (<i>review and update</i>)

CFR – Code of Federal Regulations

RCW – Revised Code of Washington

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Acronyms

A		N	
ACS	Aquatic Conservation Strategy	NEPA	National Environmental Policy Act
AMSL	above mean sea level	NRHP	National Register of Historic Places
B		O	
BMPs	best management practices	OHWM	ordinary high water mark
C		R	
CFR	Code of Federal Regulations	RCW	Revised Code of Washington
D		ROD	Record of Decision
DAHP	Washington State Department of Archaeology and Historic Preservation	SEPA	State Environmental Policy Act
E		U	
EIS	Environmental Impact Statement	US	United States
EPM	Environmental Procedures Manual	USBR	US Bureau of Reclamation
ES	East Shed	USFS	US Forest Service
ESA	Endangered Species Act	USFWS	US Fish and Wildlife Service
F		V	
FHWA	Federal Highway Administration	VE	value engineering
I		W	
I-90	Interstate 90	WSDOT	Washington State Department of Transportation
IDT	Interdisciplinary Team		
M			
MOU	Memorandum of Understanding		
MP	milepost		

Summary

Introduction

Interstate 90 (I-90) is a critical transportation link within Washington State, connecting Puget Sound's large population and business centers with the farmlands, diverse industries, and extensive recreational areas of Eastern Washington. The uninterrupted movement of people, freight, and goods over Snoqualmie Pass is essential to the quality of life and economic vitality of Washington State.

The I-90 Snoqualmie Pass East Project (I-90 project) is located on the east side of Snoqualmie Pass between the community of Hyak, at milepost (MP) 55.1, and the community of Easton, at MP 70.3 (Exhibit S-1). This 15-mile stretch of I-90 is in Kittitas County, Washington, and passes through the Okanogan-Wenatchee National Forest.

Exhibit S-1
I-90 Project Area



What is the status of the I-90 project?

Washington State Department of Transportation (WSDOT) published a Final Environmental Impact Statement (EIS) for the I-90 project in July 2008 (WSDOT 2008a). The Preferred Alternative was to widen the existing highway from four lanes to six in the same approximate alignment. In October 2008, the Federal Highway Administration (FHWA) signed the Record of Decision (ROD), which identified the Preferred Alternative from the 2008 Final EIS as the Selected Alternative for construction. WSDOT secured funding for the initial five miles of construction (Phase 1) and awarded the first of three Phase 1 construction contracts to begin work in 2009. Construction has continued into 2012.

In fall 2011, WSDOT awarded the third Phase 1 construction contract, which included highway improvements from MP 57.3 to MP 60.2, demolition of the snowshed along Keechelus Lake (Existing Snowshed), and construction of a new, expanded snowshed (Selected Snowshed). The contractor subsequently proposed a design modification to construct eastbound and westbound avalanche bridges (Proposed Bridges) instead of the Selected Snowshed. The contractor proposed this design modification through the Cost Reduction Incentive Proposal process. This process encourages contractors to be innovative in planning and performing work. WSDOT evaluated the proposal and granted concept approval of the Proposed Bridges because they introduce several benefits to the I-90 project, including the following:

- Reduction of long-term operations and maintenance costs by eliminating the Selected Snowshed and many of its electrical, mechanical, and fire suppression systems;
- Implementation of industry-standard engineering design and construction methods for bridge structures that avoid uncertainties associated with a more complicated, unique snowshed structure;
- Transfer of risk associated with structural design from the state to the contractor; and
- Improvement in traffic movement during construction by increasing the distance between construction activities and the traveling public.

The **Selected Alternative** in the 2008 ROD is Keechelus Lake Alignment Alternative 4, which includes construction of three lanes in each direction around Slide Curve and demolition and replacement of the Existing Snowshed with a new, expanded snowshed that would cover all eastbound and westbound lanes in an avalanche hazard area.

Cost Reduction Incentive Proposals are intended to promote innovative ideas involving improved work methods, new products, and improved equipment. Once the Cost Reduction Incentive Proposal is approved, WSDOT and the contractor split the construction cost savings.

After preliminary evaluation and refinement of the contractor's proposal, FHWA and WSDOT decided to consider this proposed change in the I-90 project scope by preparing this Avalanche Structures Draft Supplemental EIS (Supplemental EIS).

What is a Supplemental EIS and why is it necessary?

According to the regulations implementing the National Environmental Policy Act (NEPA) for Federal-aid projects, and similar requirements in the State Environmental Policy Act (SEPA), an agency must prepare a Supplemental EIS when:

- “Changes to the [Selected Alternative] would result in significant environmental impacts that were not evaluated in the EIS; or
- New information or circumstances relevant to environmental concerns and bearings on the [Selected Alternative] or its impacts would result in significant environmental impacts not evaluated in the EIS” [Title 23 Code of Federal Regulations (CFR), Section 771.130(a)].

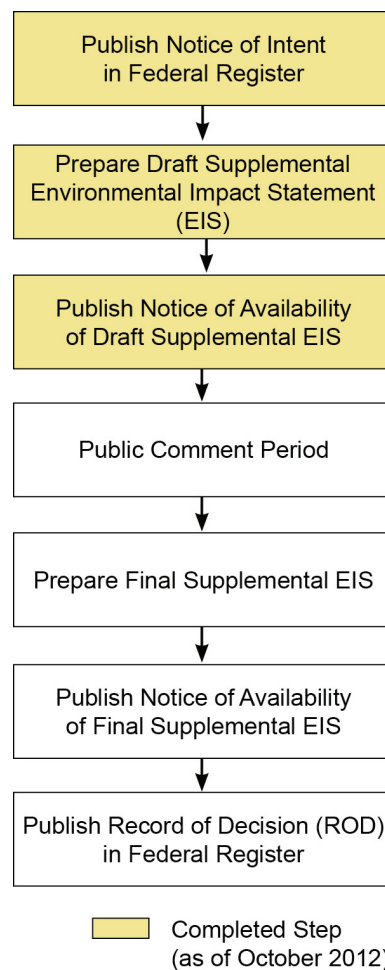
FHWA and WSDOT reevaluated the NEPA analysis conducted for the I-90 project's 2005 Draft EIS and 2008 Final EIS. Uncertainty regarding the design and potential impacts of the Proposed Bridges led to the determination that a limited-scope Supplemental EIS was appropriate. As of the publication of this Draft Supplemental EIS, most of the uncertainty has been resolved.

This Supplemental EIS is being developed using the same process as a typical EIS, except that public scoping is not required [Title 23 CFR, Section 771.130(d)]. Exhibit S-2 shows the steps in the Supplemental EIS process, with completed steps shown in yellow.

What options are evaluated in this Supplemental EIS?

The scope of this Supplemental EIS is limited to analyzing the potential impacts of constructing, operating, and maintaining the Proposed Bridges and comparing them to the potential impacts of the Selected Snowshed as described in the 2008 Final EIS and ROD. Activities evaluated in this Supplemental EIS are all located on I-90 between MP 57.9 and MP 58.4.

Exhibit S-2
Supplemental EIS Process



Selected Snowshed

The Selected Snowshed option would include demolition of the 500-foot-long Existing Snowshed at MP 58.1 and replacement with a new 1,100-foot-long concrete structure. The Selected Snowshed would be constructed along the shoreline of Keechelus Lake, in the same general location as the Existing Snowshed. This option would reduce risks associated with avalanches, rock fall, and landslides in this location by covering the highway with a protective structure. The Selected Snowshed would require ongoing maintenance of the electrical, lighting, ventilation, and fire and life-safety systems associated with the structure and clearing of snow and debris from the top of the structure and the adjacent snow containment trench on an as-needed basis.



The Selected Snowshed would cover all lanes of traffic and protect the traveling public from the avalanche paths shown in blue (lake elevation at 2,490 feet above mean sea level in this design visualization).

Proposed Bridges

The Proposed Bridges option would replace the Existing Snowshed with eastbound and westbound avalanche bridges. The 1,200-foot-long bridges would be constructed along the shoreline of Keechelus Lake, in the same general location as the Existing Snowshed. This option would reduce risks associated with avalanches, rock fall, and landslides in this location by removing and stabilizing loose materials located upslope from the highway and by physically separating the highway from the hillside.



The Proposed Bridges would carry traffic over the avalanche paths shown in blue (lake elevation at 2,490 feet above mean sea level in this design visualization).

The Proposed Bridges are designed high enough to allow typical avalanches, rock, and debris to pass under the highway without impacting traffic. Although the bridge piers are designed to withstand potential impact forces from avalanches, the potential for the piers to be directly impacted by avalanches is reduced by locating the piers on raised benches between avalanche paths and building up fill material around the piers to form a series of chutes that would assist in directing sliding snow, rock, and debris between the piers and toward the lake. Ongoing maintenance of the Proposed Bridges would involve annual inspections, plowing and de-icing of the highway, and clearing of snow and debris from the avalanche chutes and adjacent snow containment trench on an as-needed basis.

Do both options meet the I-90 project purpose and need?

The purpose and need for a project drives the process of alternative identification, analysis, and selection. The purpose of the I-90 project

is to meet projected traffic demands, improve public safety, and meet the identified project needs for a 15-mile stretch of I-90 between the communities of Hyak and Easton, in Kittitas County, Washington. Both the Proposed Bridges and Selected Snowshed support the I-90 project purpose and meet the identified project needs, as described below.

Avalanches

I-90 is frequently closed due to avalanches and associated control work. These closures strand motorists and freight on Snoqualmie Pass, resulting in substantial safety hazards to the traveling public, travel delays, and impacts to the state's economy. The traveling public and movement of goods remain at risk as long as the avalanche problem is not resolved. The risk will increase with growth in traffic volumes.

Both options are designed to provide a similar level of protection from avalanches, improving public safety and reducing avalanche-related road closures. The Selected Snowshed would reduce closures by covering all six lanes of traffic to allow avalanches to pass over the top of the structure without impacting traffic. The Proposed Bridges would reduce closures by elevating and separating the highway from the hillside, allowing avalanches to pass under the highway without impacting traffic. Each structure is designed to withstand impact by avalanches. Reduced visibility for drivers during powder avalanches is addressed by the enclosed nature of the Selected Snowshed and the height of the Proposed Bridges.



Avalanches in the I-90 project area regularly close I-90.

Slope Instability

I-90 has several unstable slopes, which results in rock and debris falling onto the roadway, causing damage to property and loss of life. These slopes will continue to pose a threat to property and safety if they are not stabilized or if the highway is not realigned to avoid areas of slope instability.

The Selected Snowshed and Proposed Bridges would both address safety risks from falling rock and greatly reduce the number of road closures because of rock fall. Both options would include removal of overburden and excavation of the adjacent hillside to remove loose rock and boulders. The two options would also use similar techniques to stabilize the new rock face on the adjacent hillside and further minimize the potential for rock fall, including the use of rock



Unstable slopes in the I-90 project area lead to rock fall.

anchors (dowels and bolts), wire mesh, or cable net slope drapery. Both structures are designed to protect the traveling public from falling rock, but differ in their approach. The enclosed Selected Snowshed structure would support the hillside and cover traffic lanes to protect drivers from falling rocks. The Proposed Bridges would elevate and separate the highway from the hillside, allowing debris to pass under the highway without impacting traffic. The placement of the bridge piers on raised benches and the creation of avalanche chutes help protect the structure by directing falling rock and debris between the piers.

Structural Deficiencies

The pavement on I-90 is beyond its design life and the roadway is rapidly deteriorating. If it is not repaired or replaced, continued deterioration of the roadway will result in unsafe driving conditions, increased vehicle damage, travel delay, and eventual failure of the roadway.

The Selected Snowshed and Proposed Bridges would both remove and replace the deteriorated highway surface from MP 57.9 to MP 58.4.



Cracked and deteriorated pavement on I-90.

Traffic Volumes

Traffic volumes on I-90 are increasing at an estimated rate of 2.1 percent per year and are expected to increase at a similar rate well into the future. Traffic volumes already exceed the highway's design capacity during peak travel periods. The worsening traffic situation may lead to higher numbers of accidents, adverse economic impacts, and increased travel times.

Both the Selected Snowshed and Proposed Bridges would meet capacity needs for projected traffic volumes by accommodating three lanes of traffic in each direction from MP 57.9 to MP 58.4.



Recreational vehicles and freight traveling on I-90 during a holiday weekend.

Ecological Connectivity

Federal land management plans have documented that I-90 forms a barrier to fish and wildlife movement, and have identified the need to increase ecological connectivity across the highway. Improving ecological connectivity will advance federal land management goals by reducing fish and wildlife population isolation. It also will reduce the risks to wildlife and the public from collisions between vehicles and wildlife.

The need for improving ecological connectivity would not be affected by the Selected Snowshed or Proposed Bridges. All of the proposed wildlife crossings, intended to reconnect habitats and reduce collisions between vehicles and wildlife, are located outside this segment of the highway (MP 57.9 to MP 58.4), as are all of the habitat linkage areas identified in the 2008 Final EIS.

How would the Proposed Bridges affect I-90 project cost?

Design, environmental analysis, and construction of the Proposed Bridges are anticipated to cost essentially the same as construction of the Selected Snowshed. The annual cost to operate and maintain the Proposed Bridges is estimated at \$100,000. The annual operations and maintenance cost for the Selected Snowshed is over \$750,000. The potential cost savings over the 75-year design life of the structures (approximately \$48 million) is one of the primary reasons FHWA and WSDOT are considering the Proposed Bridges.

How do the effects of the Proposed Bridges compare to the Selected Snowshed?

The 2008 Final EIS concluded that the beneficial effects of the I-90 project with the Selected Snowshed would be much more extensive than the adverse impacts. The beneficial effects of the I-90 project (see Exhibit ES-9 of the 2008 Final EIS) are generally upheld by the Proposed Bridges, including the reduction of avalanche and rock fall hazards, implementation of the Cascadian Architectural design theme, reduction in traffic delays, and improvement in water quality. Relative to the Selected Snowshed, the Proposed Bridges also offer additional benefits to the I-90 project, including:

- less fill material placed in Keechelus Lake,
- a slight increase in the storage capacity of Keechelus Lake, and
- creation of new aquatic habitat underneath the bridge structures (Exhibit S-3).



Elk killed in collision with vehicle near a proposed wildlife overcrossing structure.

Exhibit S-3

Selected Snowshed and Proposed Bridges at Keechelus Lake High-Pool Elevation (Design Visualizations)



The Selected Snowshed and Proposed Bridges provide a similar level of protection from avalanches and falling rock and debris, occupy roughly the same footprint, and result in similar impacts to natural resources. However, in some cases the Proposed Bridges would result in additional adverse impacts relative to the Selected Snowshed, including:

- more impacts to terrestrial habitat,
- acquisition of additional highway easement area, and
- a slight reduction in visual quality.

The permanent beneficial effects and adverse impacts of the entire 15-mile I-90 project are summarized in Exhibit S-4 along with the effects and impacts of the Selected Snowshed and Proposed Bridges.

Exhibit S-4**Permanent Beneficial Effects and Adverse Impacts of the I-90 Project, Selected Snowshed, and Proposed Bridges**

Element of the Environment	Entire I-90 Project ¹	Selected Snowshed	Proposed Bridges	Difference (Identifies which option is more favorable)
Geology, Soils, Avalanche, and Rock Fall				
Avalanche Hazard	Decrease	Decrease	Decrease	None ²
Unstable Slope Hazard (rock fall)	Decrease	Decrease	Decrease	None ²
Water Resources				
Treated Impervious Area (acres)	192.70	5.11	8.18	None ³
New Keechelus Lake Storage Capacity (acre feet)	0	0	28	28 acre-feet more storage with Proposed Bridges
Wetlands and Other Jurisdictional Waters				
Wetlands (acres)	16.20	0.06	0.06	None
Wetland (Lakeshore) Buffers (acres)	21.09	1.25	1.19	0.06 acre less impact with Proposed Bridges
Jurisdictional Ditches (linear feet)	3,810	200	200	None
Keechelus Lake (acres)	3.80	0.40	0.05	0.35 acre less impact with Proposed Bridges
Fish, Aquatic Species, and Habitats				
New Aquatic Habitat at High-Pool Elevation (acres)	0	0	2.22	2.22 acres more new habitat with Proposed Bridges
Terrestrial Species				
Total Terrestrial Habitat (acres)	248.7	4.45	7.71	3.26 acres less impact with Selected Snowshed
Transportation				
Road Closures	Decrease	Decrease	Decrease	None ²
Land Use				
Public Land (acres)	127.2	0 ³	1.07 ⁴	1.07 acres less impact with Selected Snowshed
Visual Quality				
Average Rating at Key Views (scale of 1 to 7, with 7 being most desirable)	5.0 (High)	5.4 (High)	5.0 (High)	0.4 point higher rating with Selected Snowshed ⁵

Exhibit S-4**Permanent Beneficial Effects and Adverse Impacts of the I-90 Project, Selected Snowshed, and Proposed Bridges**

Element of the Environment	Entire I-90 Project ¹	Selected Snowshed	Proposed Bridges	Difference (Identifies which option is more favorable)
Social and Economic Resources				
Opportunity Cost of Avalanche-Related Road Closure	Decrease	Decrease	Decrease	None ²

¹ Values represent the effects of the Preferred Alternative from the 2008 Final EIS.

² Based upon applicable standards/criteria set for the project.

³ Treated impervious area for the Proposed Bridges is higher because the Selected Snowshed is considered a non-pollution-generating impervious surface. The Proposed Bridges would treat this area. Therefore, the differences negate each other (see Section 3.3).

⁴ Permanent impacts represent impacts to land outside of current right-of-way easements.

⁵ Differences of less than 1.0 in visual quality ratings are not considered a substantial visual impact.

Are the Proposed Bridges as safe as the Selected Snowshed?

The safety of the traveling public has been closely analyzed and will be seriously considered by FHWA and WSDOT in their decision on which option to construct. The Proposed Bridges have been evaluated for over a year to eliminate and reduce potential safety concerns. As a result, FHWA and WSDOT consider the Proposed Bridges as safe as the Selected Snowshed because they both meet:

- avalanche design criteria (powder and dense flow),
- national safety design standards (road geometrics and fire-life safety), and
- WSDOT factors of safety (rock fall and slope stability).

How would FHWA and WSDOT mitigate for the adverse impacts of the Proposed Bridges?

FHWA and WSDOT committed to a comprehensive list of best management practices (BMPs) and compensatory mitigation measures in the 2008 Final EIS to mitigate for any substantial adverse environmental impacts of the I-90 project. Impacts related to the Proposed Bridges were identified during the NEPA process and the design has been adjusted to decrease these impacts where

practicable. This “mitigation-by-design” process will continue through the Final Supplemental EIS, design, permitting, and construction. As discussed in Chapter 3, the Proposed Bridges would not result in any new substantial adverse impacts. Therefore, no additional BMPs or compensatory mitigation measures are anticipated for the Proposed Bridges.

What issues remain?

The following issues were identified during development of this Draft Supplemental EIS:

- Acquisition of an additional right-of-way easement from the US Forest Service for the Proposed Bridges, to be finalized upon completion of construction.
- Re-initiation of Endangered Species Act consultation with resource agencies, including potential effects of blasting on bull trout and other lake fish during construction.

FHWA and WSDOT will address these issues through ongoing communication and consultation with agencies. New and updated information will be included in the Final Supplemental EIS.

What are the next steps?

WSDOT is hosting public hearings in Bellevue, Hyak, and Ellensburg during the public comment period to solicit feedback on this Draft Supplemental EIS. FHWA and WSDOT will carefully consider comments made on this Draft Supplemental EIS and address them in a Final Supplemental EIS expected to be published in early 2013. Following this, FHWA and WSDOT will make an informed decision based on a critical examination and comparison of benefits and impacts. Since both structures would occupy roughly the same footprint and result in similar impacts to natural resources, the decision rests on the cost of long-term maintenance and operation. The decision will be published in a ROD issued by FHWA, expected in spring 2013. WSDOT can then complete SEPA requirements by adopting the FHWA-issued ROD.

If FHWA and WSDOT select the Proposed Bridges, the approvals and permits listed in Exhibit S-5 would require modification or amendment. WSDOT would then complete the final approval process with the contractor and issue a Notice to Proceed. Otherwise, WSDOT intends to proceed with construction of the Selected

FHWA and WSDOT are the joint **lead agencies** responsible for preparation of this Supplemental EIS. The USFS and USBR are **cooperating agencies** in preparation of this Supplemental EIS because they have jurisdiction by law over land needed for the I-90 project.

Snowshed as described in the 2008 Final EIS and ROD. Construction of either option is expected to begin in spring 2013, after the ROD is issued.

Exhibit S-5
Permits and Approvals for the Proposed Bridges

Agency	Statute	Permit/Approval
Federal		
US Fish and Wildlife Service/ National Oceanic and Atmospheric Administration Fisheries	Endangered Species Act Section 7 consultation and concurrence (impact to listed species) Migratory Bird Treaty Act	Consultation and Biological Opinion (<i>re- initiation of consultation based on new design information</i>)
US Army Corps of Engineers	Clean Water Act	Section 404 Individual Permit (<i>regulatory update and/or reissuance</i>)
US Forest Service	Acquisition of Rights-of-Way – Interstate System [Title 23 US Code 107(d)]	Consistency determination with the US Forest Service Forest Plan(s) (<i>review and update</i>)
US Forest Service	Organic Act of 1897, National Forest Management Act of 1976	Access Permit(s) and Special Use Permit(s) (<i>review and update</i>)
US Bureau of Reclamation	Use of Bureau of Reclamation Land, Facilities, and Waterbodies (Title 43 CFR Part 429) Reclamation Act of 1902 (Public Law 57-161) Reclamation Reform Act of 1982 (Title II of Public Law 97-293)	Use Authorization (<i>review and update</i>) US Forest Service Permit(s) (<i>review and concur</i>)
State		
Washington State Department of Ecology	Clean Water Act Section 401	Water Quality Certification (<i>modification</i>)
Washington State Department of Ecology	Shoreline Management Act (RCW 90.58)	Consider administrative appeals
Washington Department of Fish and Wildlife	Construction Projects in State Waters (RCW 77.55)	Hydraulic Project Approval (<i>modification</i>)
Local		
Kittitas County	County Code (Title 17 and 18) and Shoreline Management Act (RCW 90.58)	Substantial Development Permit(s) and/or exemption, Critical Areas Ordinance review, and limited zoning review (<i>review and update</i>)

CFR – Code of Federal Regulations

RCW – Revised Code of Washington

Chapter 1 Introduction

Interstate 90 (I-90) spans 300 miles in Washington State from the Port of Seattle to the Idaho state line, and then continues east across the United States (US) to Boston, Massachusetts. I-90 is the major east-west transportation corridor across Washington and is vital to the state's economy.

The Federal Highway Administration (FHWA) and the Washington State Department of Transportation (WSDOT) are improving a 15-mile portion of I-90. The I-90 Snoqualmie Pass East Project (I-90 project) area begins on the eastern side of Snoqualmie Pass near the Hyak Interchange at milepost (MP) 55.1, and ends at the West Easton Interchange at MP 70.3 near the unincorporated community of Easton. Exhibit 1-1 shows the I-90 project area.

Activities evaluated in this Draft Supplemental Environmental Impact Statement are located within a small portion of the 15-mile I-90 project area, between MP 57.9 and MP 58.4.

Exhibit 1-1
I-90 Project Area



1.1 What is the current status of the I-90 project?

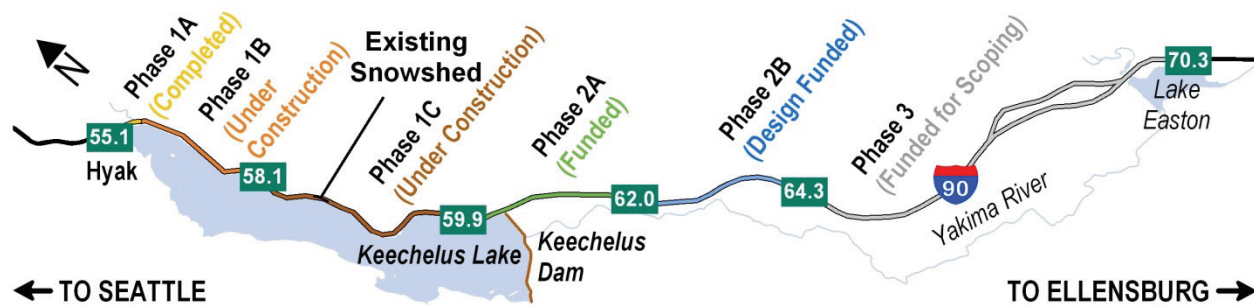
WSDOT published a Final Environmental Impact Statement (EIS) for the I-90 project in July 2008 (WSDOT 2008a). The 2008 Final EIS evaluated alternatives in support of two decisions: how to rebuild the highway along 3.3 miles of I-90 on the east shore of Keechelus Lake, and how to improve habitat connections along the remainder of the I-90 project corridor. The Preferred Alternative included widening the existing highway from four lanes to six in the same approximate alignment (Keechelus Lake Alignment Alternative 4) and implementing a multi-agency-approved subset of the connectivity emphasis area options. In October 2008, FHWA issued the Record of Decision (ROD), which identified the Preferred Alternative from the 2008 Final EIS as the Selected Alternative for construction.

To facilitate design and construction, WSDOT divided the I-90 project into three main phases (Exhibit 1-2). Phase 1 extends from Hyak (MP 55.1) to Keechelus Dam (MP 59.9) and is fully funded and under construction. Phase 2 extends from Keechelus Dam to the Cabin Creek interchange (MP 64.3) and is partially funded. Phase 3 is funded for scoping only and covers the remaining portion of the I-90 project to Easton at MP 70.3.

The **Selected Alternative** in the 2008 ROD is Keechelus Lake Alignment Alternative 4, which includes construction of three lanes in each direction around Slide Curve and demolition and replacement of the Existing Snowshed with a new, expanded snowshed that would cover all eastbound and westbound lanes in an avalanche hazard area.

Connectivity emphasis areas are locations within the I-90 project corridor that could benefit from ecological connectivity improvements.

Exhibit 1-2
Construction Phases of the I-90 Project



Each phase of the I-90 project is divided into smaller sub-phases for construction purposes, as funding becomes available. Construction of Phase 1A began in 2009, which involved construction of a detour bridge, excavation of material from Keechelus Lake, and stockpiling at Crystal Springs Sno-Park. Construction of Phase 1B (from

MP 55.1 to MP 58.1) began in 2010, and is improving the first three miles of the I-90 project by constructing a new six-lane highway and extending chain-up and -off areas. Construction of Phase 1C (MP 58.1 to MP 59.9) began in 2011, and is upgrading and adding lanes to I-90 between the existing snowshed at MP 58.1 (Existing Snowshed) and Keechelus Dam. Pre-design work is under way on Phase 2A (MP 59.9 to MP 62.0) and Phase 2B (MP 62.0 to MP 64.3), which includes new chain-up areas, the first wildlife overcrossing, and replacement of two interchanges. It should be noted that construction sub-phases often overlap due to temporary ties to facilitate traffic movement between the old and new sections of I-90.

In fall 2011, the contractor selected to construct Phase 1C, Guy F. Atkinson Construction, proposed a design modification to construct eastbound and westbound avalanche bridges (Proposed Bridges) instead of the expanded snowshed that was included as part of the Selected Alternative (Selected Snowshed) in the 2008 ROD. The Selected Snowshed and Proposed Bridges are described in more detail in Chapter 2.

1.2 Why is this design modification being evaluated?

The construction contractor proposed this design modification through the Cost Reduction Incentive Proposal process. This process encourages contractors to be innovative in planning and performing work for the state. WSDOT granted concept approval of the Proposed Bridges because they introduce several benefits to the I-90 project, including the following:

- Reduction of long-term operations and maintenance costs by eliminating many of the electrical, mechanical, and fire suppression systems required for the Selected Snowshed;
- Implementation of industry-standard engineering designs and construction methods for bridge structures that avoid uncertainties associated with the non-standard techniques and components required for the more complicated, unique Selected Snowshed;
- Transfer of risk associated with structural design from the state to the contractor; and

Cost Reduction Incentive Proposals are intended to promote innovative ideas involving improved work methods, new products, and improved equipment. Once the Cost Reduction Incentive Proposal is approved, WSDOT and the contractor split the construction cost savings.

- Improvement in traffic movement during construction by increasing the distance between the construction area and the traveling public.

After preliminary evaluation and refinement of the proposed design modification, FHWA and WSDOT decided to consider this proposed change in the I-90 project scope by preparing this Avalanche Structures Draft Supplemental EIS (Supplemental EIS).

1.3 Why is this Supplemental EIS necessary?

According to the regulations implementing the National Environmental Policy Act (NEPA) for Federal-aid projects and similar requirements in the State Environmental Policy Act (SEPA), an agency must prepare a Supplemental EIS when:

- “Changes to the [Selected Alternative] would result in significant environmental impacts that were not evaluated in the [2005 Draft and 2008 Final EIS]; or
- New information or circumstances relevant to environmental concerns and bearings on the [Selected Alternative] or its impacts would result in significant environmental impacts not evaluated in the [2005 Draft and 2008 Final EIS]” [Title 23 Code of Federal Regulations (CFR), Section 771.130(a)].

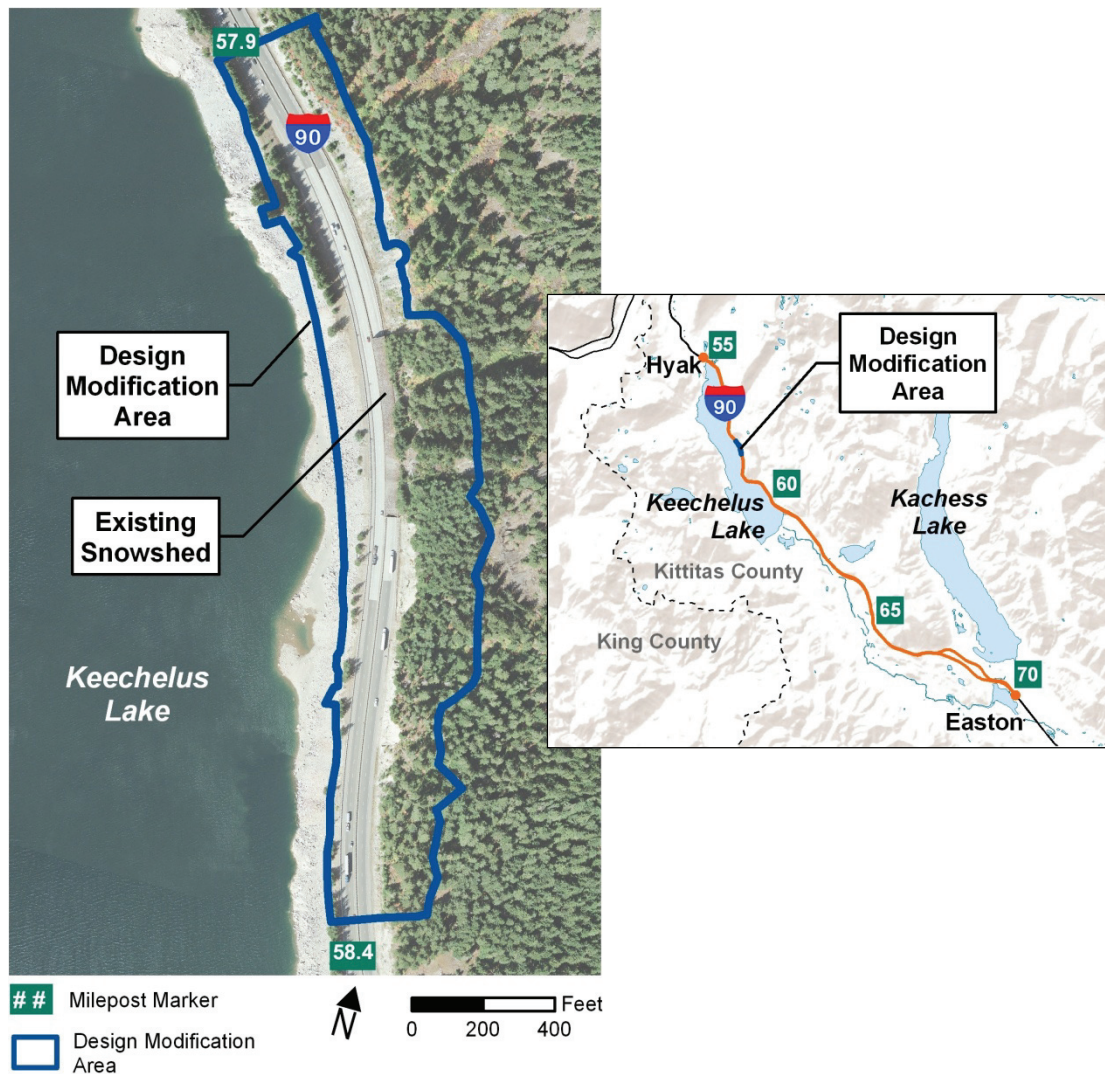
FHWA and WSDOT reevaluated the NEPA analysis conducted for the I-90 project’s 2005 Draft EIS (WSDOT 2005) and 2008 Final EIS. Uncertainty regarding the design and potential impacts of the Proposed Bridges led to the determination that a limited-scope Supplemental EIS was appropriate. As of the publication of this Draft Supplemental EIS, most of the uncertainty has been resolved.

1.4 How does this limited-scope Supplemental EIS differ from the 2005 Draft EIS and 2008 Final EIS?

The 2005 Draft EIS and 2008 Final EIS evaluated potential social, economic, and environmental impacts associated with a full range of reasonable alternatives within the entire 15-mile I-90 project

corridor. The scope of this Supplemental EIS is limited to comparing and contrasting the potential impacts of constructing, operating, and maintaining two options that replace and improve on the function of the Existing Snowshed: the Selected Snowshed and the Proposed Bridges. This Supplemental EIS evaluates activities associated with each option located between MP 57.9 and MP 58.4, within the area labeled “design modification area” in Exhibit 1-3. The limited-scope nature of this Supplemental EIS allows WSDOT to continue with construction of Phase 1C of the I-90 project, consistent with Title 23 CFR, Section 771.130(f)(3).

Exhibit 1-3
Design Modification Area



This Supplemental EIS is being developed using the same process as a typical EIS. However, since issues and concerns related to the I-90 project are well known from the extensive public involvement conducted for the 2005 Draft and 2008 Final EIS, it was determined that additional public scoping comments would not be required or solicited. This approach is consistent with Title 23 CFR, Section 771.130(d). Public comments received on this Draft Supplemental EIS will be addressed in a Final Supplemental EIS to be published in early 2013. Issuance of the ROD is expected in spring 2013. A detailed description of the typical EIS process is provided in Section 1.10 of the 2008 Final EIS, and Exhibit 1-4 defines the steps of the Supplemental EIS process.

1.5 Do both options meet the I-90 project purpose and need?

The purpose and need for a project drives the process of alternative identification, analysis, and selection. The purpose of the I-90 project is to meet projected traffic demands, improve public safety, and meet the identified project needs for a 15-mile stretch of I-90 between the communities of Hyak and Easton, in Kittitas County, Washington (WSDOT 2008a).

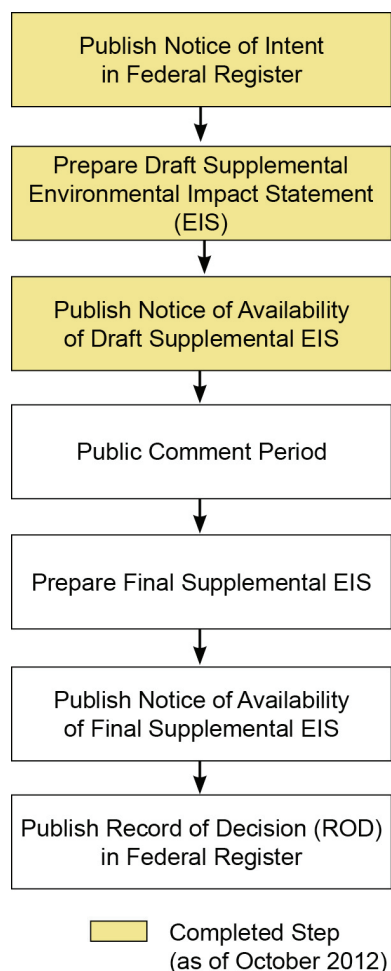
Both the Selected Snowshed and the Proposed Bridges support the I-90 project purpose and meet the identified project needs, as described below.

Avalanches

I-90 is frequently closed due to avalanches and associated control work. These closures strand motorists and freight on Snoqualmie Pass, resulting in substantial safety hazards to the traveling public, travel delays, and impacts to the state's economy. The traveling public and movement of goods remain at risk as long as the avalanche problem is not resolved. The risk will increase with growth in traffic volumes.

Both options are designed to provide a similar level of protection from avalanches (see Section 2.3), improving public safety and reducing avalanche-related road closures. The Selected Snowshed would reduce avalanche-related road closures by covering the highway and allowing avalanches to pass over the top of the structure without impacting traffic. The Proposed Bridges would

Exhibit 1-4
Supplemental EIS Process



Avalanches in the I-90 project area regularly close I-90.

reduce closures by elevating and separating the highway from the hillside, allowing avalanches to pass under the highway without impacting traffic. Each structure is designed to withstand impact by avalanches. Reduced visibility for drivers during powder avalanches is addressed by the enclosed nature of the Selected Snowshed and the height of the Proposed Bridges.

Slope Instability

I-90 has several unstable slopes, which results in rock and debris falling onto the roadway, causing damage to property and loss of life. These slopes will continue to pose a threat to property and safety if they are not stabilized or if the highway is not realigned to avoid areas of slope instability.

The Selected Snowshed and Proposed Bridges would both address safety risks from falling rock and greatly reduce the number of road closures because of rock fall. Both options would include removal of overburden and excavation of the adjacent hillside to remove loose rock and boulders. The two options would also use similar techniques to stabilize the new rock face on the adjacent hillside and further minimize the potential for rock fall, including the use of rock anchors (dowels and bolts), wire mesh, or cable net slope drapery. Both structures are designed to protect the traveling public from falling rock, but differ in their approach. The enclosed Selected Snowshed structure would support the hillside and cover traffic lanes to protect drivers from falling rocks. The Proposed Bridges would elevate and separate the highway from the hillside, allowing debris to pass under the highway without impacting traffic. The placement of the bridge piers on raised benches and the creation of avalanche chutes help protect the structure by directing falling rock and debris between the piers.



Unstable slopes in the I-90 project area lead to rock fall.

Structural Deficiencies

The pavement on I-90 is beyond its design life and the roadway is rapidly deteriorating. If it is not repaired or replaced, continued deterioration of the roadway will result in unsafe driving conditions, increased vehicle damage, travel delay, and eventual failure of the roadway.

The Selected Snowshed and the Proposed Bridges would remove and replace the deteriorated highway surface from MP 57.9 to MP 58.4, bringing the roadway up to current WSDOT design standards.



Cracked and deteriorated pavement on I-90.

Traffic Volumes

Traffic volumes on I-90 are increasing at an estimated rate of 2.1 percent per year and are expected to increase at a similar rate well into the future. Traffic volumes already exceed the highway's design capacity during peak travel periods. The worsening traffic situation may lead to higher numbers of accidents, adverse economic impacts, and increased travel times.

Both the Selected Snowshed and Proposed Bridges would meet capacity needs for projected traffic volumes by accommodating three lanes of traffic in each direction from MP 57.9 to MP 58.4.

Ecological Connectivity

Federal land management plans have documented that I-90 forms a barrier to fish and wildlife movement, and have identified the need to increase ecological connectivity across the highway. Improving ecological connectivity will advance federal land management goals by reducing fish and wildlife population isolation. It also will reduce the risks to wildlife and the public from collisions between vehicles and wildlife.

The need for improving ecological connectivity would not be affected by the design modification. All of the proposed wildlife crossings, intended to reconnect habitats and reduce collisions between vehicles and wildlife, are located outside the design modification area, as are all of the habitat linkage areas identified in the 2008 Final EIS.

1.6 Who are the lead agencies and what decisions do they need to make?

Under both NEPA and SEPA, the project proponent is the person or agency that proposes to carry out the project, and the lead agency or agencies are responsible for preparing the environmental document. As in the 2005 Draft EIS and 2008 Final EIS, WSDOT is the project proponent, FHWA and WSDOT are the joint lead agencies, and WSDOT is the lead agency for SEPA. FHWA is responsible for ensuring the continued safe and efficient operation of the Interstate System, and ensuring compliance with all Federal laws and



Recreational vehicles and freight traveling on I-90 during a holiday weekend.



Elk killed in collision with vehicle near a proposed wildlife overcrossing structure.



regulations, including NEPA. WSDOT is leading the environmental analysis, highway design, and construction efforts.

FHWA and WSDOT will address comments made on this Draft Supplemental EIS in the Final Supplemental EIS, expected to be published in early 2013. Following this, FHWA and WSDOT will make an informed decision based on a critical examination and comparison of impacts to natural resources and long-term operations and maintenance costs. The decision will be published in a ROD issued by FHWA, expected in spring 2013. WSDOT can then complete SEPA requirements by adopting the FHWA-issued ROD.

1.7 Who are the cooperating agencies and what decisions do they need to make?

Under NEPA, a cooperating agency has jurisdiction by law over an aspect of the project or special expertise related to the project or the environmental analysis. As in the 2005 Draft EIS and 2008 Final EIS, the US Forest Service (USFS) and the US Bureau of Reclamation (USBR) are cooperating agencies with FHWA and WSDOT in the preparation of this Supplemental EIS. Both agencies concurred with the decision to prepare a Supplemental EIS.

The USFS and USBR jointly manage public land within the design modification area. The USFS manages the shoreline above the ordinary high water mark (OHWM) of Keechelus Lake. As the lake is drawn down, the land managed by USFS expands below the OHWM, down to the low pool elevation. Portions of the design modification area are located within the USFS Riparian Reserves buffer area, as defined by the USFS Aquatic Conservation Strategy (ACS). USFS issued a consistency determination for the I-90 project on August 18, 2009, indicating that the I-90 project is consistent with USFS land management documents (Appendix A). The consistency determination was issued in support of a highway easement, also known as a Federal Land Transfer. A subsequent consistency determination will be required if FHWA and WSDOT select the Proposed Bridges for construction in the ROD (see Section 4.2).



The USBR has jurisdiction over Keechelus Dam and water in Keechelus Lake. As such, USBR concurrence is required to place fill or excavate in Keechelus Lake, which would occur under either option. As co-managers of the land surrounding Keechelus Lake, the USBR will also review and concur with the permits and approvals issued by the USFS for the Proposed Bridges.

FHWA and WSDOT have consulted continuously with the USFS and USBR on the I-90 project, as described in Chapter 4, Consultation and Coordination. The USFS and USBR are also engaged as members of the multi-agency project Interdisciplinary Team (IDT). The IDT provides a forum for communication between the lead agencies and the cooperating and permitting agencies.

1.8 What permits and approvals are required?

If FHWA and WSDOT select the Proposed Bridges in the ROD, Phase 1C approvals and permits listed in Exhibit 1-5 would require modification or amendment. The Selected Snowshed is already permitted and approved. WSDOT intends to proceed with construction of the Selected Snowshed if the Proposed Bridges are not selected in the ROD. Construction of either option is expected to begin in spring 2013, after the ROD is issued.

Exhibit 1-5 **Permits and Approvals for the Proposed Bridges**

The **Interdisciplinary Team (IDT)** is an advisory body consisting of cooperating and permitting agencies formed to incorporate both relevant science and the concerns of agency stakeholders. I-90 project IDT member agencies include:

- Federal Highway Administration
- US Forest Service
- US Bureau of Reclamation
- National Oceanic and Atmospheric Administration Fisheries
- US Environmental Protection Agency
- US Fish and Wildlife Service
- US Army Corps of Engineers
- Washington State Parks and Recreation Commission
- Washington State Department of Ecology
- Washington Department of Fish and Wildlife
- Washington State Department of Transportation
- Kittitas County

Agency	Statute	Permit/Approval
Federal		
US Fish and Wildlife Service/ National Oceanic and Atmospheric Administration Fisheries	Endangered Species Act Section 7 consultation and concurrence (impact to listed species) Migratory Bird Treaty Act	Consultation and Biological Opinion (<i>re- initiation of consultation based on new design information</i>)
US Army Corps of Engineers	Clean Water Act	Section 404 Individual Permit (<i>regulatory update and/or reissuance</i>)
US Forest Service	Acquisition of Rights-of-Way – Interstate System [Title 23 US Code 107(d)]	Consistency determination with the US Forest Service Forest Plan(s) (<i>review and update</i>)
US Forest Service	Organic Act of 1897, National Forest Management Act of 1976	Access Permit(s) and Special Use Permit(s) (<i>review and update</i>)

Exhibit 1-5
Permits and Approvals for the Proposed Bridges

Agency	Statute	Permit/Approval
US Bureau of Reclamation	Use of Bureau of Reclamation Land, Facilities, and Waterbodies (Title 43 CFR Part 429) Reclamation Act of 1902 (Public Law 57-161) Reclamation Reform Act of 1982 (Title II of Public Law 97-293)	Use Authorization (<i>review and update</i>) US Forest Service Permit(s) (<i>review and concur</i>)
State		
Washington State Department of Ecology	Clean Water Act Section 401	Water Quality Certification (<i>modification</i>)
Washington State Department of Ecology	Shoreline Management Act (RCW 90.58)	Consider administrative appeals
Washington Department of Fish and Wildlife	Construction Projects in State Waters (RCW 77.55)	Hydraulic Project Approval (<i>modification</i>)
Local		
Kittitas County	County Code (Title 17 and 18) and Shoreline Management Act (RCW 90.58)	Substantial Development Permit(s) and/or exemption, Critical Areas Ordinance review, and limited zoning review (<i>review and update</i>)

CFR – Code of Federal Regulations

RCW – Revised Code of Washington

Chapter 2 Options Considered (Alternatives)

FHWA and WSDOT worked with other governmental agencies, tribes, partner organizations, and the public from 1996 to 2008 in an effort to develop and consider a full range of reasonable alternatives that address I-90 project needs. Chapter 2 of the 2008 Final EIS describes the alternative identification process and the range of alternatives analyzed. The alternatives addressed the entire 15-mile I-90 project corridor and included project elements that are outside the limited scope of this Supplemental EIS.

This Supplemental EIS focuses on design options that address project needs associated with the Existing Snowshed. Chapter 2 briefly summarizes the options previously considered by FHWA and WSDOT, followed by a detailed description of the options carried forward for further analysis.

2.1 What options did FHWA and WSDOT previously consider?

FHWA and WSDOT previously evaluated the following options that were included as part of one or more alternatives in the 2005 Draft EIS or 2008 Final EIS.

- Existing Snowshed: The Existing Snowshed and highway would be maintained and active management of avalanches and unstable slopes would continue. This option was part of the No-Build Alternative, which did not meet the project needs and was rejected in the 2008 ROD.
- Long tunnels: The Existing Snowshed would remain in place to preserve it as a historic site, and two 1.9-mile-long tunnels with three lanes in each direction would be built along Keechelus Lake. This option would completely bypass the avalanche zone and unstable slopes in the design modification area. The long tunnels were part of Keechelus Lake Alignment Alternative 1, which was rejected in the 2008 ROD due to the tunnels causing greater engineering risks, maintenance cost, operational difficulties, and environmental consequences.

NEPA requires evaluation of a **No-Action (No-Build) Alternative**, which consists of continuation of the current management direction. Other alternatives considered in an EIS are commonly compared to the baseline set by the No-Build Alternative.

- **Viaduct bridges:** The Existing Snowshed would remain in place to preserve it as a historic site, and two long viaduct bridges would be built over a portion of Keechelus Lake. The viaduct bridges were part of Keechelus Lake Alignment Alternatives 2, 3, and 4 in the 2005 Draft EIS but were eliminated from further consideration in the 2008 Final EIS due to safety, constructability, and operational concerns (refer to Section 2.4).
- **Selected Snowshed:** The Existing Snowshed would be demolished; the highway would be re-built with three lanes in each direction; and the Selected Snowshed would be constructed over the highway. The Selected Snowshed was part of Keechelus Lake Alignment Alternatives 2, 3 and 4 in the 2008 Final EIS. Alignment Alternatives 2 and 3 also included short tunnels and were rejected in the 2008 ROD for the same reasons as Alignment Alternative 1. FHWA and WSDOT selected Alignment Alternative 4, including the Selected Snowshed, for construction in the 2008 ROD. Construction of the Selected Snowshed represents the baseline condition.

Keechelus Lake Alignment Alternatives 1, 2, 3, and 4, described in detail in Chapter 2 of the 2008 Final EIS, represent the range of build alternatives for the highway along the east shore of Keechelus Lake.

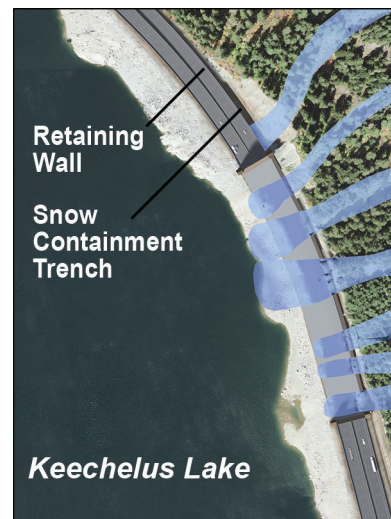
Alignment Alternatives 1, 2, and 3 included tunnels in different configurations and were rejected in the 2008 ROD due to the tunnels causing greater engineering risks, maintenance cost, operational difficulties, and environmental consequences.

2.2 What options are evaluated in this Draft Supplemental EIS?

This Draft Supplemental EIS compares the potential impacts of constructing and operating the Selected Snowshed to the potential impacts of the Proposed Bridges. The options that FHWA and WSDOT rejected during the NEPA process, concluding with the 2008 Final EIS and ROD, are not re-analyzed in this Draft Supplemental EIS.

Selected Snowshed

The Selected Snowshed option would include demolition of the 500-foot-long Existing Snowshed at MP 58.1 and replacement with a new 1,100-foot-long concrete structure (Exhibit 2-1). The Selected Snowshed would be constructed along the shoreline of Keechelus Lake, in the same general location as the Existing Snowshed. The foundation for the structure would be provided by a combination of spread footings and piers supported by drilled shafts that anchor into bedrock. The Selected Snowshed was designed in compliance with the WSDOT *Bridge Design Manual* (WSDOT 2011a).



The Selected Snowshed would cover all lanes of traffic and protect the traveling public from all but the westernmost avalanche path (design visualization shows avalanche paths in blue).

Exhibit 2-1
Selected Snowshed (Design Visualization)



Lake elevation at 2,510 feet above mean sea level (AMSL)

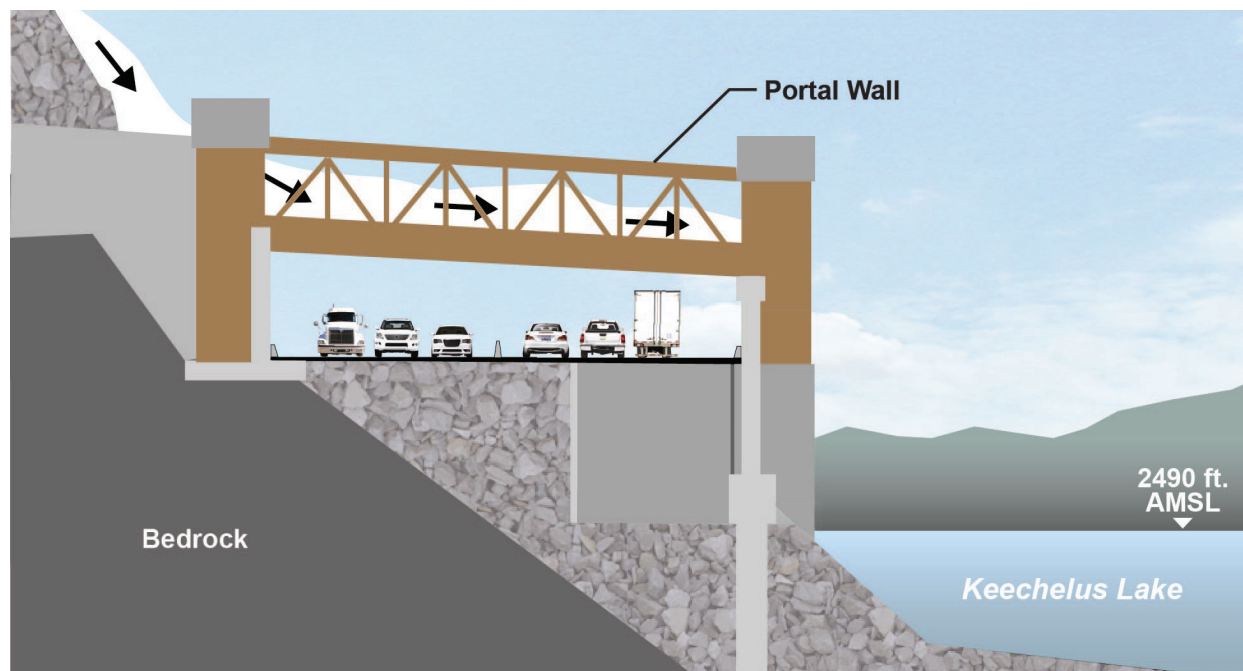
This option would reduce risks associated with avalanches, rock fall, and landslides by covering all six lanes of traffic with a protective structure designed to withstand these events (Exhibit 2-2).

Avalanches, rock, and debris from the adjacent hillside would pass over the top of the snowshed structure. The Selected Snowshed would protect the traveling public from all but the westernmost avalanche path, which does not produce powder avalanches that impact the highway in that area. A retaining wall and snow containment trench at the base of the hill along the westbound lanes would control the relatively small and infrequent dense flow avalanches known to originate from the westernmost avalanche path.

Avalanches occur when a mass of snow, ice, and debris fall rapidly down a slope. Those most commonly observed in the design modification area are characterized as **dense flow avalanches**, consisting of compacted, moist snow; and **powder avalanches**, consisting of fine particles of snow suspended in air.

An **avalanche path** is the natural route that snow takes as it travels down a slope.

Exhibit 2-2
Selected Snowshed Cross Section



The Selected Snowshed is designed to stabilize the abutting rock slope and protect traffic from falling rocks. Other measures to reduce rock fall include removing loose rock, rock bolting, shotcrete treatments, installing wire mesh over rock faces, and cutting back slopes to reduce steepness.

Proposed Bridges

The Proposed Bridges would replace the Existing Snowshed with eastbound and westbound avalanche bridges (Exhibit 2-3). The 1,200-foot-long bridges would accommodate three lanes of traffic plus shoulders in each direction along the shoreline of Keechelus Lake, in the same general location as the Existing Snowshed. A series of drilled shafts that anchor into bedrock would provide the foundation for the bridge structures. The eastbound bridge would be lower than the westbound bridge. Both bridges would be designed in compliance with the WSDOT *Bridge Design Manual* (WSDOT 2011a).

Exhibit 2-3
Proposed Bridges (Design Visualization)

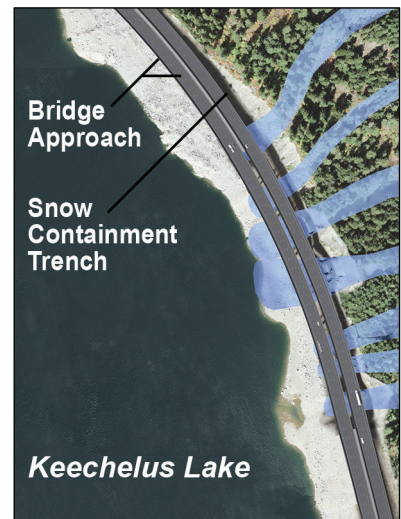


Lake elevation at 2,510 feet AMSL

The Proposed Bridges would reduce risks associated with avalanches, rock fall, and landslides by removing and stabilizing loose material located upslope from the highway and by elevating and separating the highway from the hillside. This design allows avalanches, rock, and debris to pass under the highway without impacting traffic.

The Proposed Bridges would carry traffic over all but the westernmost avalanche path, which does not produce powder avalanches that impact the highway in that area. The west bridge approach, which functions as a retaining wall, and the adjacent snow containment trench would control the relatively small and infrequent avalanches known to originate from the westernmost avalanche path.

A combination of elevating the highway above the existing grade and excavating up to 50 feet of material below the existing grade

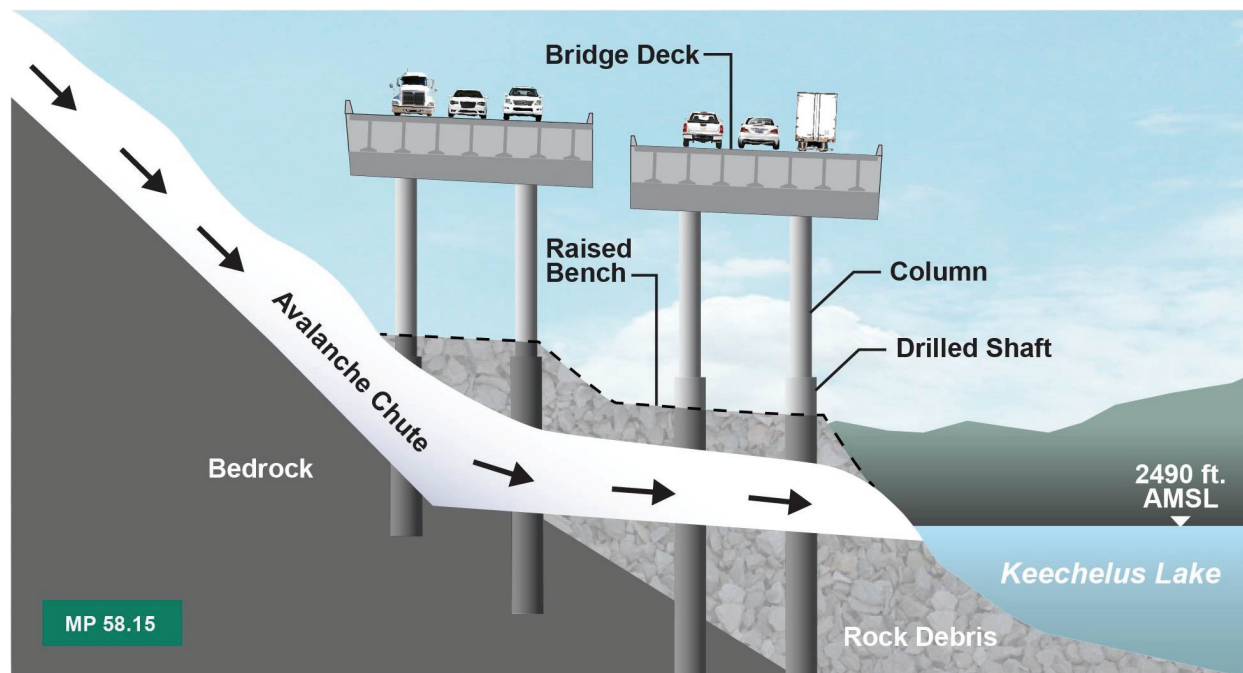


The Proposed Bridges would carry traffic over all but the westernmost avalanche path (design visualization shows avalanche paths in blue).

would provide a total clearance beneath the bridge structures ranging between 40 and 70 feet. This space would accommodate accumulation of snow from snowfall, plowing, and avalanches with adequate space between the top of the accumulated snow and the bridge decks to protect motorists from additional avalanches. The storage area beneath the bridge structures would be engineered into a series of chutes that would direct sliding snow, rock, and debris between the bridge piers and toward the lake (Exhibit 2-4).

Avalanche chutes are the excavated and contoured paths underneath the Proposed Bridges that direct avalanches between the bridge piers.

Exhibit 2-4
Proposed Bridges Cross Section



The potential for the bridge piers to be directly impacted by avalanches and rocks is reduced by:

- locating bridge piers between avalanche paths where avalanche forces are less,
- placing the piers on raised benches, and
- building up fill material (rocks) around the piers to form chutes that direct avalanches and rocks between the piers.

The **bridge piers** include a drilled shaft and column, shown in Exhibit 2-4. A **raised bench** would protect the bridge piers from snow, rock, and debris directed into the avalanche chutes.

However, the bridge piers are designed to withstand potential impact forces from avalanches, in the event that the chutes fill with snow and avalanches are diverted towards the piers.

Techniques employed to stabilize slopes and reduce rock fall would include removing loose rock, rock bolting, shotcrete treatments, installing wire mesh over rock faces, and cutting back slopes to reduce steepness. These slope stabilization measures are designed to meet a factor of safety of 1.5, which indicates stable-slope conditions, accounts for variability of natural materials (soil and rock), and provides an extra safety margin. In addition, the westbound bridge would be horizontally separated from the hillside by 20 to 70 feet, providing space for falling rock and debris between the hillside and the bridge deck.

A **factor of safety** of 1 indicates driving and resisting forces are in equilibrium. A factor of safety less than 1 indicates driving forces are greater than resisting forces and the slope may move. A factor of safety greater than 1 indicates the resisting forces are greater than the driving forces and the slope is likely stable. Design standards often require a factor of safety between 1.25 and 1.5.

The design visualizations in Exhibit 2-5 illustrate the elevation of the Proposed Bridges relative to the Selected Snowshed (for a cross section graphic comparison, see Exhibit 3-15). The Proposed Bridges are designed at a higher elevation to accommodate the accumulation of snow and falling rocks under the highway.

Exhibit 2-5

Elevation Comparison of the Selected Snowshed and Proposed Bridges (Design Visualizations)



Selected Snowshed on Keechelus Lake shoreline at 2,490 feet AMSL (design visualization)



Proposed Bridges on Keechelus Lake shoreline at 2,490 feet AMSL (design visualization) with outline of Selected Snowshed shown in yellow

2.3 What are the avalanche design criteria?

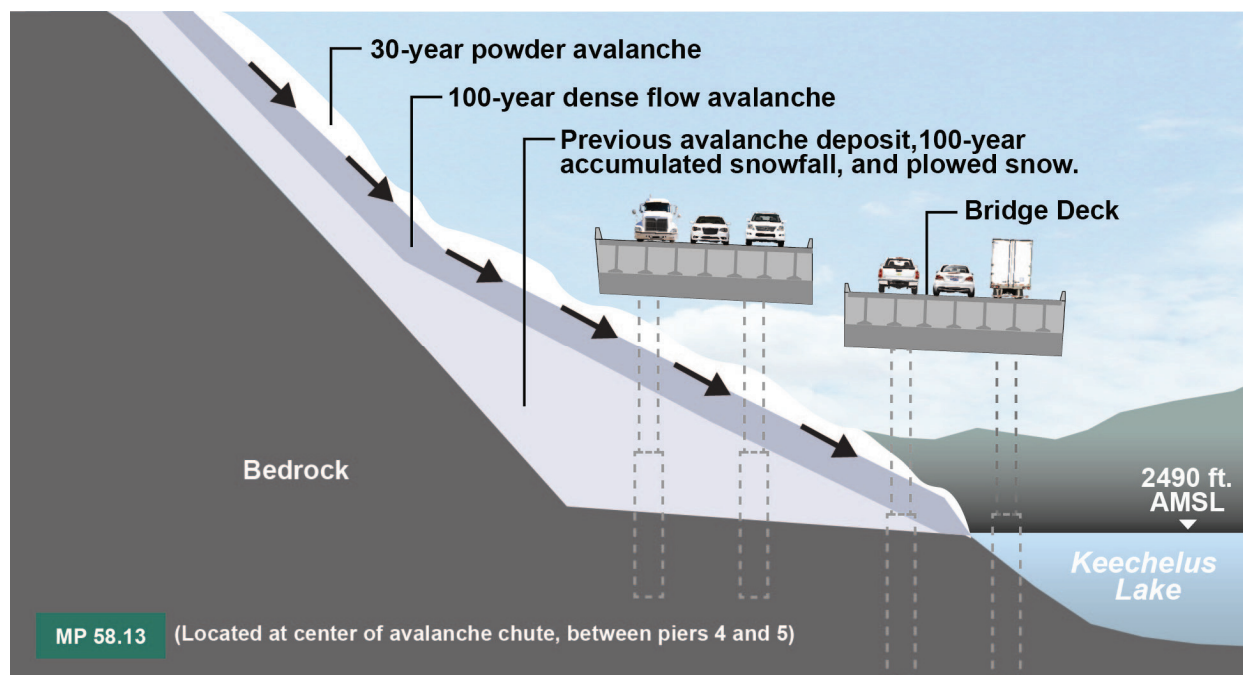
The following avalanche design criteria were established for the Proposed Bridges:

1. Dense flow avalanches up to a 100-year return period must pass underneath without impacting the structure.
2. The Proposed Bridges must provide sufficient clearance to accommodate the cumulative heights of the 100-year snowfall accumulation, plowed snow from the bridge deck, and prior avalanche deposits; plus a 100-year dense flow avalanche; plus a 30-year powder avalanche (Exhibit 2-6). This criterion is based upon these events occurring simultaneously to provide added protection.
3. The Proposed Bridges must be high enough so that vehicles are not impacted by powder avalanches more frequently than once in 30 years.
4. The bridge piers must be designed to withstand 100-year dense flow avalanche forces.

The terms **30-year or 100-year return period** are used to indicate the probability that an event of a certain magnitude will occur in any particular year. For example, a 30-year return period event has about a 3 percent chance of occurring in any particular year, and a 100-year return period event has a 1 percent chance of occurring in any particular year.

The Selected Snowshed was designed to meet equivalent criteria for 100-year snowfall accumulation and 100-year dense flow avalanches. These design criteria represent an adequate level of protection for the traveling public. The return periods used in these criteria were established based upon guidelines from Canada and Switzerland.

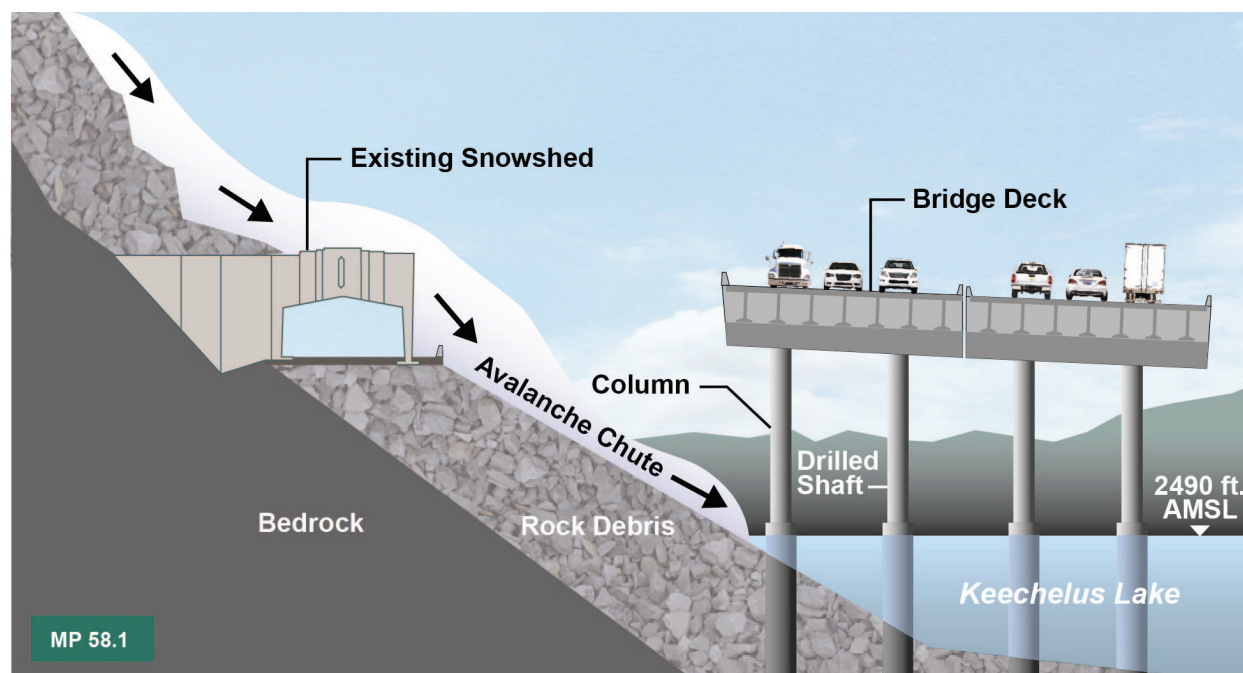
Exhibit 2-6
Maximum Snow Accumulation Underneath the Proposed Bridges



2.4 How do the Proposed Bridges differ from the viaduct bridges previously considered?

As noted in Section 2.1, FHWA and WSDOT previously considered viaduct bridges as part of Keechelus Lake Alignment Alternatives 2, 3, and 4 in the 2005 Draft EIS. The viaduct bridges option was designed to avoid impacts to the Existing Snowshed, which is a historic structure listed on the National Register of Historic Places (NRHP). As a result, the viaduct bridges were aligned farther from the hillside and spanned a portion of Keechelus Lake (Exhibit 2-7).

Exhibit 2-7
2005 Draft EIS Viaduct Bridges Cross Section



In November 2006, a value engineering (VE) team identified several serious concerns with the design of the viaduct bridges. These concerns ultimately led FHWA and WSDOT to consider “use” (removal) of the Existing Snowshed in the Section 4(f) Evaluation included as Chapter 5 of the 2008 Final EIS. Following a determination that there was no feasible and prudent alternative to avoid the use (demolition) of the Existing Snowshed, FHWA and WSDOT developed a Memorandum of Agreement with the Washington State Department of Archaeology and Historic Preservation (DAHP) that would mitigate for the removal of the Existing Snowshed. This resulted in replacement of the viaduct bridges with the Selected Snowshed as part of Keechelus Lake Alignment Alternatives 2, 3, and 4 in the 2008 Final EIS. Refer to Section 3.1 for a discussion of why the Programmatic Section 4(f) Evaluation in the 2008 Final EIS would apply to both the Selected Snowshed and the Proposed Bridges.

Value Engineering (VE) is a systematic method to improve the value of a project without sacrificing safety, necessary quality, or environmental attributes. VE involves a multidisciplinary team of people following a structured process.

Exhibit 2-8 compares the viaduct bridges to the Proposed Bridges by presenting the design features side by side. It also summarizes the concerns with the viaduct bridges identified by the VE team and describes how these concerns are addressed by the proposed Bridges.

Exhibit 2-8**Comparison between 2005 Draft EIS Viaduct Bridges and Proposed Bridges**

2005 Draft EIS Viaduct Bridges		Proposed Bridges
Design Features		
Bridge length	Two multiple span bridges (1,500 feet long and 1,200 feet long)	Two multiple span bridges (each 1,200 feet long)
Bridge height	Support structures 170 feet above bedrock	Support structures 110 feet above bedrock
Alignment	Spans a portion of Keechelus Lake	Stays along the Keechelus Lake shoreline
Value Engineering Team Concern with 2005 Draft EIS Viaduct Bridges		
Avalanche risk	Avalanche modeling indicated that a powder blast could deflect off the Existing Snowshed, causing white-out conditions that obscure visibility on the viaduct.	The Existing Snowshed and material from the hillside would be removed to provide sufficient clearance for dense flow and powder avalanches under the bridge structures, thereby minimizing white-out conditions.
Constructability	The lake in the location of the viaduct bridges is very deep, with a steeply sloping bottom and poor quality bedrock. Support structures would have been impractical to build.	Construction would occur on roughly the same horizontal alignment as the existing highway, avoiding very high support structures and deep in-water construction.
Construction safety and access	Access to the work area during construction would be limited by the narrow eastbound road shoulders and steep embankment slopes.	Access during construction would not be limited by the use of barges. Access along the shoreline would continue to be limited by narrow shoulders and steep slopes.
In-water work	Shafts would be constructed below the water level of Keechelus Lake.	Fewer shafts would be constructed, and they would be constructed in the dry, when lake levels are drawn down.

The engineering difficulties and construction risks associated with the viaduct bridges (Exhibit 2-8) approach the level of fatal flaws. The removal of the Existing Snowshed and the design of the Proposed Bridges along the Keechelus Lake shoreline address all of the concerns that made the viaduct bridges unacceptable.

2.5 How would the Proposed Bridges affect I-90 project costs?

Guy F. Atkinson Construction, the Phase 1C construction contractor, submitted a bid of approximately \$177 million (2011 dollars) to construct Phase 1C of the I-90 project, which includes approximately

\$71 million to construct the Selected Snowshed. Design, environmental analysis, and construction of the Proposed Bridges are anticipated to cost essentially the same amount (Exhibit 2-9).

Exhibit 2-9

Estimated Cost to Construct, Operate, and Maintain the Selected Snowshed and Proposed Bridges

	Selected Snowshed	Proposed Bridges	Difference
Estimated construction cost	\$71 million	\$71 million	None ¹
Estimated annual operation and maintenance cost	\$750,000	\$100,000	-\$650,000
Estimated 75-year life-cycle operations and maintenance costs	\$56 million	\$8 million	-\$48 million

¹ The construction contractor for Phase 1C submitted a no-cost change order to construct the Proposed Bridges instead of the Selected Snowshed.

The cost difference between the Selected Snowshed and Proposed Bridges is associated with operations and maintenance activities that WSDOT must perform to keep the highway open to traffic and in good condition. The estimated annual and 75-year life-cycle cost to operate and maintain each option is shown in Exhibit 2-9.

The Selected Snowshed would require ongoing maintenance of the electrical, lighting, ventilation, and fire and life-safety systems associated with the structure and infrequent clearing of debris from the snow containment trench. Maintaining these systems would require additional full-time WSDOT maintenance personnel in addition to standard upkeep costs. Local emergency service providers would also require specific training for a tunnel (snowshed) emergency response. The annual cost to operate and maintain the Selected Snowshed is estimated by WSDOT at approximately \$750,000.

Ongoing maintenance of the Proposed Bridges would involve annual inspections, plowing and de-icing of the highway, and infrequent clearing of debris from the avalanche chutes and snow containment trench. For the first 20 years of the life of the bridge structures, existing WSDOT maintenance personnel would manage ongoing maintenance activities. Additional staffing may be required once the bridge structures age. Additional staffing is not included in the annual cost to operate and maintain the Proposed Bridges, which is estimated by WSDOT at \$100,000. The potential annual savings in

operations and maintenance costs (\$650,000) is one of the primary benefits of the Proposed Bridges.

WSDOT is conducting additional analysis to determine the threshold at which an extreme avalanche event could affect each structure or impact traffic. The results of the analysis will help determine how often active avalanche control and snow removal may need to occur for each structure. These additional maintenance costs are expected to be minimal and are not included in the cost estimates provided in Exhibit 2-9.

The usable life of either structure can be extended by structural rehabilitation activities. Structural rehabilitation for the Selected Snowshed may include concrete roadway rehabilitation, roof expansion joints sealing, roof repairs, and corrosion repairs. Structural rehabilitation for the Proposed Bridges may include bridge deck rehabilitation, expansion joint replacement, and bridge column and grade beam repairs (R. Stoddard, pers. comm., July 26, 2012). Structural rehabilitation costs are not included in the operations and maintenance cost estimate for either option provided in Exhibit 2-9. However, WSDOT anticipates that these costs will be similar for either option (S. Golbek, pers. comm., August 3, 2012).

Chapter 3 Affected Environment, Consequences, and Mitigation

This chapter presents the environmental consequences of each option for nine disciplines, mitigation for adverse impacts, as well as cumulative effects and other environmental considerations. Other disciplines were studied briefly and found to be unchanged and sufficiently described in the 2008 Final EIS and ROD.

3.1 Disciplines Evaluated

This Draft Supplemental EIS is limited in scope, focusing on potential differences in construction and operational effects of the Selected Snowshed compared to those of the Proposed Bridges.

What disciplines were evaluated for this Supplemental EIS?

To identify affected disciplines, WSDOT reviewed the 2005 Draft EIS, the 2008 Final EIS, and supporting documentation such as public comments, discipline reports, and technical memoranda. Relevant regulations, agency guidance, and management plans were also reviewed for changes that may affect the previous analyses. Because the limited area and type of impacts associated with the Proposed Bridges would affect only certain disciplines, the original disciplines analyzed in the 2008 Final EIS were divided into two categories: no further study needed and further study conducted.

No Further Study Needed

WSDOT determined that no further study was needed for disciplines that would not be affected by the Proposed Bridges, or for which no resources are located within the design modification area. The analysis conducted for the 2008 Final EIS remains valid for these disciplines, and no further supplement or amendment is required in this Draft Supplemental EIS (Exhibit 3-1). Letters to file document these conclusions (Appendix B).

No further study is needed for:

- Air quality
- Noise
- Historic, cultural, and archaeological resources
- Recreation resources
- Hazardous materials and waste
- Energy
- Social and economic resources (utilities and environmental justice)

Further study was conducted for:

- Geology, soils, avalanche, and rock fall
- Water resources
- Wetlands and other jurisdictional waters
- Fish, aquatic species, and habitats
- Terrestrial species
- Transportation
- Land use
- Visual quality
- Social and economic resources (socioeconomics and public services)

Further Study Conducted

Further study was conducted for disciplines that required more in-depth analysis to determine the potential impacts of the Proposed Bridges (Exhibit 3-1). The study area for each discipline is the design modification area, except visual quality and social and economic resources, which are defined in those sections. Permanent and temporary impacts to these disciplines and associated mitigation were evaluated in technical updates (see appendices) and are summarized in this chapter.

Exhibit 3-1

Disciplines Considered for this Draft Supplemental EIS

Discipline	Justification
Letters To File – No Further Study Needed	
Air Quality	The Proposed Bridges would not change traffic volumes or associated vehicle emissions. Construction emissions would not change.
Noise	The Proposed Bridges would not change construction noise levels or traffic volumes and associated operational noise levels. There are no noise-sensitive receivers within the design modification area.
Historic, Cultural, and Archaeological Resources	The design modification area is within the original Area of Potential Effect. Removal of the Existing Snowshed is addressed in the ROD. Both options occupy the same footprint along the shoreline of Keechelus Lake, in a location with minimal potential to encounter archaeological resources.
Recreation Resources	There are no recreation resources within the design modification area.
Social and Economic Resources ¹	The Proposed Bridges would not change impacts to utilities or minority or low-income populations.
Hazardous Materials and Waste	There are no known hazardous material sites located within the design modification area.
Energy	Construction of the Proposed Bridges would require approximately the same amount of energy as the Selected Snowshed. Operation of the Proposed Bridges would require less energy.
Technical Updates – Further Study Conducted	
Geology, Soils, Avalanche, and Rock Fall ²	The Proposed Bridges would change or address these issues differently than the Selected Snowshed: cut and fill volumes and potential erosion, rock fall, landslide, and avalanche hazards.
Water Resources	The Proposed Bridges would change design and/or mitigation methods for water quality and lake storage capacity.
Wetlands and Other Jurisdictional Waters	The Proposed Bridges would change impact quantities to waters of the US.

Exhibit 3-1**Disciplines Considered for this Draft Supplemental EIS**

Discipline	Justification
Fish, Aquatic Species, and Habitats	Blasting, work below the OHWM, and stormwater runoff associated with the Proposed Bridges would change impacts and/or mitigation to aquatic resources.
Terrestrial Species	The additional excavation for the Proposed Bridges would increase impacts to terrestrial habitat.
Transportation	The Proposed Bridges would change road closures, maintenance requirements, and maintenance of traffic during construction.
Land Use	The footprint of the Proposed Bridges extends up the hillside outside of the existing right-of-way, potentially adding to USFS easement requirements.
Visual Quality	The Proposed Bridges would change views from and of the highway.
Social and Economic Resources ¹	The Proposed Bridges would change the opportunity cost of I-90 road closures and affect emergency response.

¹ Social and economic resources are evaluated in the Socioeconomics Technical Update, Public Services Technical Update, Environmental Justice Letter to File, and Utilities Letter to File.

² Geology, soils, avalanche, and rock fall are evaluated in the Geology and Soils, Unstable Slope Hazard Areas, and Avalanche Risk and Mitigation Technical Updates.

OHWM – Ordinary High Water Mark

ROD – Record of Decision

Were impacts to Section 4(f) and Section 6(f) resources evaluated?

The 2005 Draft EIS and 2008 Final EIS evaluated the effects of the project on Section 4(f) and Section 6(f) resources. The Proposed Bridges evaluated in this Draft Supplemental EIS would not change the conclusions of the previous Section 4(f) and Section 6(f) evaluations. As documented in the 2008 Final EIS, the only Section 6(f) resource located in the I-90 project area is Crystal Springs Sno-Park. This resource is located outside the design modification area and, therefore, is outside the limited scope of this Draft Supplemental EIS.

The Existing Snowshed is the only Section 4(f) resource within the design modification area. It meets the criteria for a Section 4(f) resource because it was listed on the NRHP in 1995. Chapter 5 of the 2008 Final EIS, *Programmatic Section 4(f) Evaluation*, applies FHWA guidelines from the *Programmatic Section 4(f) Evaluation and Approval of FHWA Projects that Necessitate the Use of Historic*

A **Section 4(f) property** is a publicly-owned park, recreation area, wildlife and waterfowl refuge, or a historic site of national, state, or local significance, as regulated under Section 4(f) of the Department of Transportation Act of 1966. (23 CFR 774)

A **Section 6(f) property** is any property that is acquired or developed with financial assistance under Section 6(f) of the federal Land and Water Conservation Fund Act. (36 CFR 59)

Bridges (FHWA 1983) to the alternatives considered in the 2005 Draft EIS and 2008 Final EIS. That evaluation resulted in the finding that there are no feasible and prudent alternatives to the use (demolition) of the Existing Snowshed.

The design options that address the I-90 project purpose and need and have the least overall harm are those that maintain the current highway alignment. Steep unstable slopes on one side of the highway, and Keechelus Lake on the other, constrain viable alignments to this one location. Alternatives that diverged from the current alignment, thereby avoiding the Existing Snowshed, were fully evaluated and found to result in environmental, geotechnical, and economic impacts of extraordinary magnitude.

The Proposed Bridges would maintain virtually the same footprint and alignment as the Selected Snowshed, meet the I-90 project purpose and need, and result in comparable impacts. Therefore, the Programmatic Section 4(f) Evaluation presented in the 2008 Final EIS is also applicable to the Proposed Bridges.

FHWA, WSDOT, and DAHP developed a Memorandum of Agreement that documents mitigation measures for removal of the Existing Snowshed (see Appendix C to Chapter 5 of the 2008 Final EIS). These measures were completed in September 2009 before construction began on Phase 1A. Mitigation would not change regardless of which option FHWA and WSDOT choose to construct.

3.2 Geology, Soils, Avalanche, and Rock Fall

This section discusses the potential impacts of each option on geology and soils, including geologic hazards associated with erosion, unstable slopes, and avalanches.

The location of unstable slopes and avalanche hazard areas for the I-90 project are shown in Exhibit 2-11 of the 2008 Final EIS. More information on regional geology is provided in the *Geology and Soils Technical Update* and the *Unstable Slope Hazard Areas Technical Update* (Appendices C and D). Additional information on avalanches is provided in the *Avalanche Risk and Mitigation Technical Update* (Appendix E).



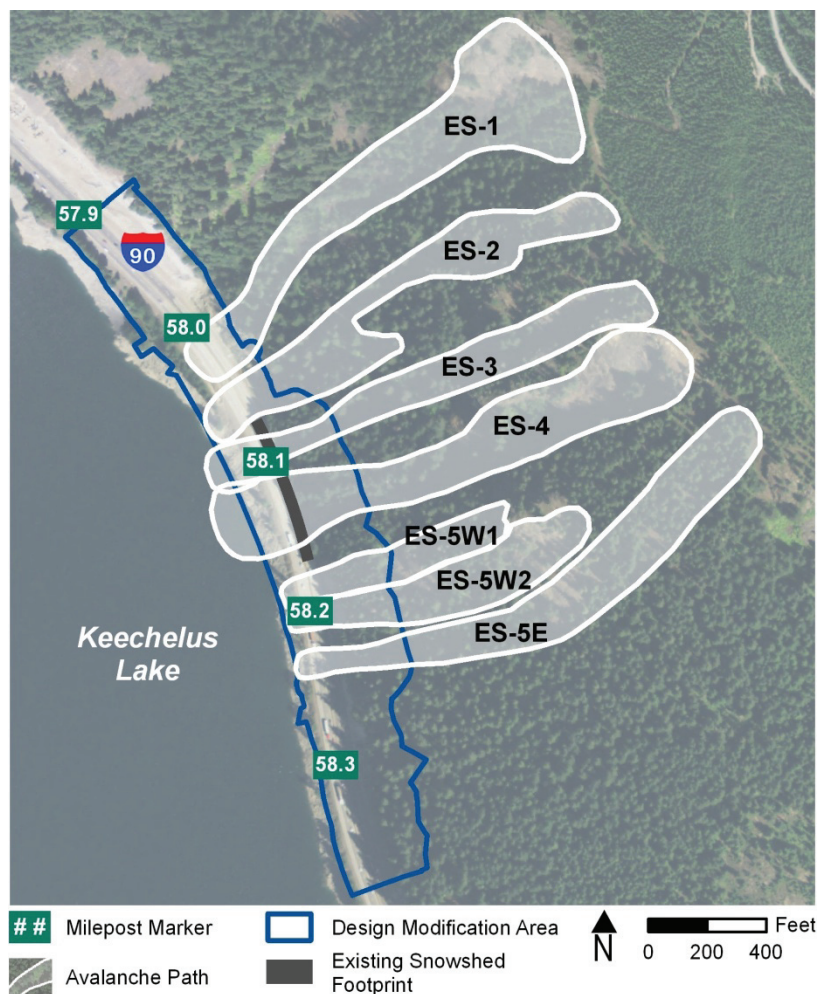
The Existing Snowshed, a Section 4(f) resource, will be removed to construct either option.

What has changed since the Record of Decision was issued?

The affected environment for geology, soils, avalanche, and rock fall as described in Section 3.1 of the 2008 Final EIS is relatively unchanged. However, WSDOT conducted geologic and geotechnical investigations to further assess subsurface soil and rock conditions in Phase 1C of the I-90 project (URS 2011, Wyllie & Norrish 2009). WSDOT also conducted additional analysis for avalanches within the design modification area. This analysis included additional avalanche modeling and revisions to avalanche paths within the design modification area, as illustrated in Exhibit 3-2. Formal avalanche design criteria for the Selected Snowshed were not established during preparation of the 2008 Final EIS and 2008 ROD. Design criteria for the Proposed Bridges were prepared after the design modification was proposed, and are described in Section 2.3.

Exhibit 3-2

Avalanche Paths in the Design Modification Area



The most persistent avalanche zone through Snoqualmie Pass is east of the summit along Keechelus Lake. This area is known as the **East Shed (ES)** and is responsible for approximately 70% of avalanche-related road closures within the Snoqualmie Pass area.

Avalanche paths within the ES are shown in Exhibit 3-2. There is one avalanche path each for ES 1, 2, 3, and 4. There are three avalanche paths for ES 5, which are designated 5 West 1 (5W1), 5 West 2 (5W2), and 5 East (5E).

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Excavation

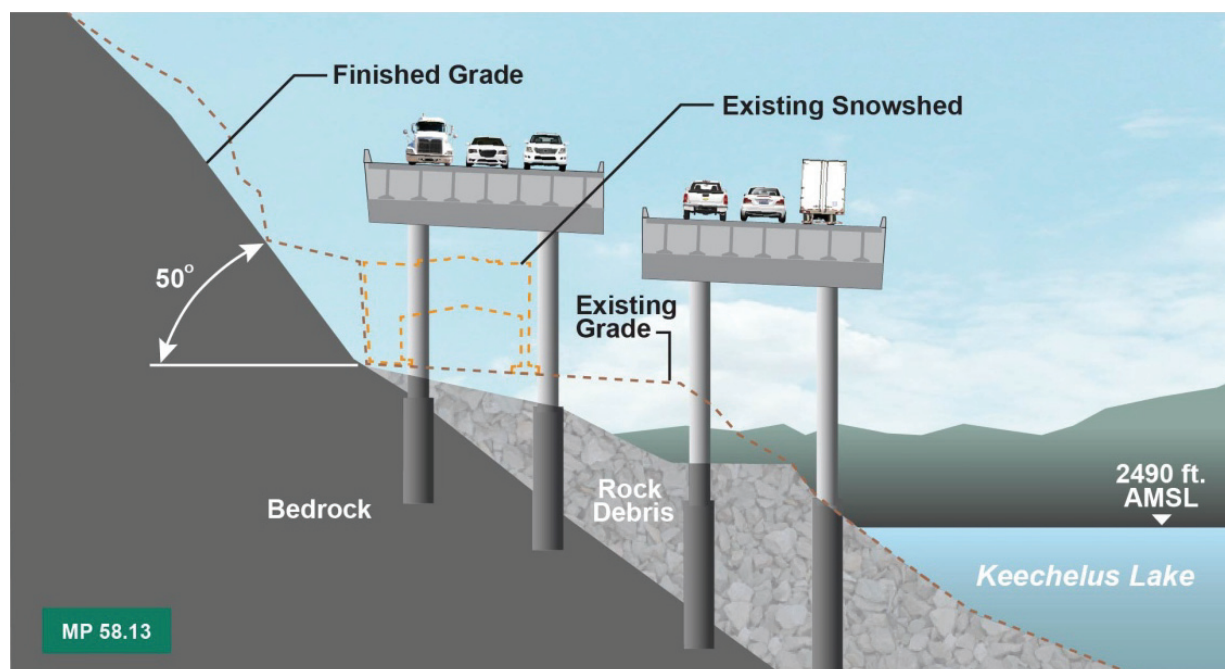
The Selected Snowshed would require excavation of approximately 122,100 cubic yards of material (Exhibit 3-3). Excavation for the Proposed Bridges would remove more material from a larger area than the Selected Snowshed. An estimated 95,900 cubic yards of additional rock material would be excavated upslope of, under, and around the bridge structures, for a total of 218,000 cubic yards (see existing and finished grades in Exhibit 3-4). However, approximately 120,000 cubic yards of material would be directly hauled from the excavation site and placed as common borrow fill for the Proposed Bridge approaches. The remainder of the material would be processed at sites identified in the *Materials and Staging Report* (WSDOT 2008b), which would reduce the amount of imported fill needed for the I-90 project.

Exhibit 3-3

Estimated Cut and Fill Volumes (cubic yards)

Material Type	Selected Snowshed	Proposed Bridges	Difference
Total Cut	122,100	218,000	95,900
Total Fill	35,850	165,900	130,050
Net Cut/Fill	86,250 (net cut)	52,100 (net cut)	-34,150

Exhibit 3-4
Excavation and Bridge Foundation



Erosion Hazards

The design modification area is located on a steeply sloping hillside, in an area highly susceptible to erosion. As documented in the 2008 Final EIS, construction of the I-90 project has the potential to increase erosion and deliver sediment to receiving waters. WSDOT committed to the use of best management practices (BMPs) to minimize erosion for the I-90 project, and construction of the Proposed Bridges instead of the Selected Snowshed would not change this commitment. Potential BMPs may include revegetating exposed soil areas, reducing the length and steepness of slopes with exposed soils, and covering stockpiled soils with plastic sheeting.

Furthermore, the presence of erodible soils would not impact foundation stability because the deep foundations planned to support the Proposed Bridges are well below the top soils susceptible to erosion. Both options would be supported on deep foundations anchored in bedrock (Exhibit 3-4).

Avalanche Hazards

Construction of either option would take place over several summer construction seasons, when avalanches are not a potential hazard to

Best management practices, commonly referred to as BMPs, are methods used to avoid or minimize environmental impacts. These practices represent the most practical methods available and are continually being improved. BMPs are most commonly applied to minimize erosion during construction.

The effectiveness of construction BMPs will be monitored by WSDOT as part of the construction compliance program for the I-90 project. This allows WSDOT to adjust or replace BMPs to assure compliance with performance standards.

the traveling public. Between construction seasons, traffic would be routed through the design modification area in a predetermined, winter configuration similar to existing conditions. Construction of either option would include one winter without structural avalanche protection, following demolition of the Existing Snowshed (P. Larson, pers. comm., June 7, 2012). Without structural avalanche protection, there will be an increased risk from avalanches. WSDOT will increase avalanche control for either option accordingly. As a result, road closures and delays are expected to be more frequent for both options during this one winter. Therefore, risks associated with avalanche hazards during construction of either option are not substantially different.

Unstable Slope Hazards

There are three unstable slopes located within the design modification area with the potential for falling rock (rock fall). Activities such as blasting, excavation, and temporary drainage may increase localized rock fall and landslide hazards during construction. The Proposed Bridges would require more extensive rock cut than the Selected Snowshed to create space for snow and debris to pass beneath the bridge structures (Exhibit 3-4). The additional rock cuts increase the potential for rock fall for this option during construction. To mitigate the potential for rock fall, both options would use the same types of BMPs to stabilize slopes during construction, such as temporary containment fences for rock fall, blasting in lifts rather than large blasts, and slope monitoring to track slope movement or settlement.

Rock cut refers to the removal of rock material from the hillside using blasting or other means.

Permanent Impacts

Erosion Hazards

Once construction is complete, erodible soils would be stabilized using industry-standard BMPs such as soil preparation and integrated vegetation planting and management. Neither option would result in permanent impacts.

Avalanche Hazards

One of the greatest benefits of either option is the reduction of avalanche hazards within the design modification area. Reducing avalanche hazards increases public safety and reduces highway closures and travel delays. Natural avalanches and active avalanche control currently require an average of 42 hours of annual highway

closures in the design modification area, where approximately 70 percent of avalanche-related road closures occur on I-90 Snoqualmie Pass.

Design Winter Conditions

By designing the structures to meet the criteria described in Section 2.3, powder avalanches and dense flow avalanches would not affect the traveling public under winter conditions up to a 100-year event/accumulation. Both options are designed to eliminate the need for active avalanche control and associated road closures within the design modification area. As described in Section 2.2, the Selected Snowshed and the Proposed Bridges are also designed to withstand the potential impact forces of 100-year avalanches.

Powder Avalanches. Powder avalanches were raised as a concern for the previously rejected viaduct bridges (see Section 2.4). Powder avalanches can affect the traveling public in two ways: 1) obscured driver visibility from whiteout conditions; and 2) effects of strong crosswinds on vehicles. Avalanche design criteria were established to address these concerns. Therefore, powder avalanches would not impact traffic under design winter conditions.

Traffic within the Selected Snowshed would not be affected by crosswinds, but there is the potential for obscured visibility through the lake side openings. WSDOT would evaluate and address this issue during construction.

Traffic on the Proposed Bridges would not be affected by powder avalanches because the design includes elevation of the bridge structures, excavation of avalanche chutes underneath the bridges, and laying back the hillside to provide adequate clearance.

Extreme Winter Conditions

Extreme winter conditions occur during years of exceptionally high snowfall and severe storms. Conditions that exceed the design criteria are extremely rare and have never been recorded in this area.

In the rare event that conditions approach or exceed the design criteria, WSDOT would take appropriate action to protect the traveling public. These actions could include any or all of the following: 1) temporary highway closures; 2) active avalanche control; and 3) systematic removal of built up snow, rock, and debris. By actively removing accumulated snow from on top of the Selected Snowshed, the structure can be protected from the weight of

Active avalanche control is a process of intentionally triggering early avalanches, usually with explosives, before snow build-up becomes very deep.



Both options greatly reduce the need for active avalanche control and associated road closures.



Avalanches regularly block I-90 at the Existing Snowshed.

extreme snow accumulation and avalanches. Similarly, by removing snow from below the Proposed Bridges, the structure's ability to pass avalanches is renewed and structural risk to the bridge deck or risk to drivers from powder avalanches is reduced.

WSDOT is conducting additional analysis to determine the threshold at which an extreme avalanche event could affect each structure or impact traffic. The results of the analysis will help determine how often the above actions may be required for each option.

Unstable Slope Hazards

WSDOT designed both options to correct unstable slopes, which would be beneficial to highway safety. Slope stabilization would increase public safety and reduce delays due to rock fall and landslides.

The Selected Snowshed would reduce rock fall by removing loose rock, rock bolting, shotcrete treatments, installing wire mesh over rock faces, and cutting back slopes to reduce steepness. The Selected Snowshed is also designed to support the abutting rock slope and protect traffic lanes from falling rocks.

The Proposed Bridges would reduce risks from falling rock and debris through removal and stabilization of loose materials located upslope from the highway and by elevating and separating the highway from the hillside. The Proposed Bridges would require more extensive rock cuts to create space for passing avalanches beneath the bridge structures and to serve as a snow storage area. The rock cuts would align with existing avalanche paths to channel avalanches, falling rock, and debris between the bridge piers, which would be elevated on raised benches. The snow storage area beneath the Proposed Bridges, designed to act as a series of avalanche chutes, would direct smaller scale falling rock away from the bridge piers. Small rocks that hit the bridge piers are not anticipated to damage the concrete structure. Larger-scale rock fall would be mitigated using BMPs that have been successfully used by WSDOT elsewhere along the I-90 corridor such as scaling of loose rock debris, reinforcement with rock anchors (dowels and bolts), and wire mesh or cable net slope drapery. In the unlikely scenario that large rocks do hit the bridge piers, any resulting damage to the concrete structure would be addressed through WSDOT's ongoing bridge maintenance program.



The Proposed Bridges would require more extensive rock cuts than the Selected Snowshed.

Avalanche chutes are the excavated and contoured paths underneath the Proposed Bridges that direct avalanches between the bridge piers.

An **avalanche path** is the natural route that snow takes as it travels down a slope.

Although each option differs in its approach to addressing unstable slopes, both options reduce risks from rock fall and landslides, providing a long-term, beneficial effect to the traveling public.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

Disturbing only those areas necessary for construction would reduce temporary construction impacts to geology and soils associated with excavation. Sequencing the work strategically, such as limiting work during wet weather, would further minimize impacts.

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. Both options have been designed to minimize impacts to geology and soils and avoid and minimize rock fall and avalanche hazards. WSDOT conducted extensive geotechnical and geologic investigations and designed both avalanche structures based on the findings of those investigations. Both options are designed to stabilize areas of unstable soil and rock where necessary.

Geotechnical investigations are ongoing and will be incorporated into the final design of either option prior to construction. Both structures are also designed to meet equivalent criteria for 100-year snowfall accumulation and 100-year avalanches. However, WSDOT is undertaking an additional analysis to determine the threshold at which an extreme avalanche event could affect each structure or impact traffic. The results will help determine how often active avalanche control or snow removal may need to occur.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). If the Proposed Bridges are identified as the Preferred Alternative in the Final Supplemental EIS, the commitment to these BMPs would not change. However, WSDOT will modify existing permits and reinitiate consultation with the US Fish and Wildlife Service (USFWS) on several issues. Additional commitments may be identified during these processes.



Engineers work from a barge in Keechelus Lake to assess the subsurface soil and rock conditions near the Existing Snowshed.

Compensatory Mitigation

As a result of WSDOT's strategy of avoidance, minimization, and implementation of BMPs, neither option results in substantial adverse impacts associated with geology and soils, avalanche, and rock fall. No compensatory mitigation is required.

3.3 Water Resources

This section discusses the potential impacts of each option on water resources. Additional information is provided in the *Water Resources Technical Update* (Appendix G).

The design modification area is located partially within the USFS Riparian Reserves buffer area, which extends 150 feet from the OHWM of Keechelus Lake. The USFS Aquatic Conservation Strategy (ACS) objectives apply to this buffer area (see Section 3.5 for more information about the ACS objectives and Riparian Reserves requirements).

What has changed since the Record of Decision was issued?

No substantial changes related to water resources have occurred since the ROD was issued. The affected environment for water resources as described in Section 3.3 of the 2008 Final EIS has not changed. However, there have been updates to water resource guidance and waterbody classifications since the ROD was issued. The *Highway Runoff Manual*, which guides the design of stormwater treatment systems for highway projects, was updated (WSDOT 2011b). Both options follow the 2011 update of the manual. Additionally, Washington State Department of Ecology periodically updates the state's 303(d) list. The active list at the time the ROD was issued was the 2004 303(d) list. The US Environmental Protection Agency approved the current 303(d) list in 2009. Keechelus Lake was previously listed as an impaired waterbody in 2004 and continues to be impaired for the same reasons.

The federal **Clean Water Act**, adopted in 1972, requires states to restore their waters to be "fishable and swimmable." Every two years, all states are required to prepare a list of waterbodies that do not meet water quality standards. This list is called the **303(d) list** because the process is described in Section 303(d) of the Clean Water Act.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Surface Water Runoff

Construction activities can result in temporary impacts to surface water from soil disturbance and concrete and chemical use onsite. The Selected Snowshed and the Proposed Bridges have the same requirements for stormwater control during construction. Both options would apply industry-standard BMPs to control contaminated stormwater runoff from active construction areas.

Water Use for Construction

The 2008 Final EIS estimates that approximately 152 million gallons of water from Keechelus Lake would be used during construction of Phase 1 for processing of materials, concrete production, dust suppression, and highway fill compaction. WSDOT obtained temporary water rights for this purpose through agreements with the Washington State Department of Ecology and the USBR. The Phase 1C construction contract indicates that construction of Phase 1C with the Selected Snowshed would use approximately 108 million gallons of water. This quantity is controlled by monthly withdrawal limits which vary by month. The Proposed Bridges would not use additional water.

Surface water includes lakes, streams, ponds, and wetlands.

Groundwater is water found beneath the earth's surface in saturated soil and rock.

Highway stormwater is precipitation that runs off impervious surfaces and enters drainage features to convey and/or treat it.

Off-site stormwater is natural runoff from the adjacent hillside.

Permanent Impacts

Water Quality

Off-Site Stormwater. Construction of the Selected Snowshed would require collection of off-site stormwater and conveyance across I-90 through a series of cross culverts. This is how off-site stormwater is conveyed across the highway under existing conditions. Shallow groundwater is not expected to cross the highway underneath the Selected Snowshed because of the presence of bedrock and the collection and piping of the off-site stormwater.

Construction of the Proposed Bridges would remove the existing highway fill from the area under the bridge structures, expose the bedrock, and allow stormwater from off-site to pass as surface flow under the structure. By doing this, the Proposed Bridges would allow flow to be unrestricted by pipes and, therefore, more natural. In

doing so, WSDOT meets a commitment to the USFS under the ACS objectives. This water would not flow across the highway to accumulate pollutants and, therefore, would not result in adverse water quality impacts.

Highway Stormwater. WSDOT committed to treating stormwater runoff for the equivalent of all new and existing impervious surfaces in the I-90 project area. WSDOT also committed to providing on-site treatment systems and off-site mitigation when on-site treatment is not possible because of physical constraints. Portions of I-90 in the design modification area are untreatable due to site constraints, but compensatory mitigation will be provided by treating equivalently-sized areas at other sites within the overall I-90 project limits. The commitment to treat equivalently-sized areas at other sites meets the requirements of WSDOT's *Highway Runoff Manual*. The stormwater treatment area for both options is shown in Exhibit 3-5.

An **impervious surface** is a hard surface area that either prevents or limits the entry of water into the soil and from which water runs off at an increased rate of flow or volume (for example, rooftops, concrete paving).

A **pollution-generating impervious surface** is an impervious surface that is considered a significant source of pollutants in surface and stormwater runoff (for example, metal roofs, roads).

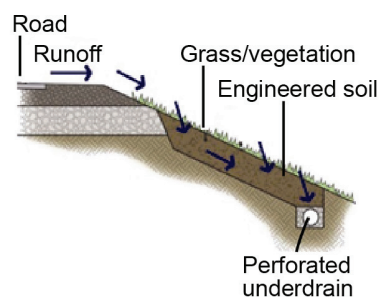
Exhibit 3-5

Selected Snowshed and Proposed Bridges Stormwater Treatment Area (acres)

	Selected Snowshed	Proposed Bridges	Difference
Treated Impervious Surface	5.11	8.18	3.07
Untreated Impervious Surface	2.69	2.62	-0.07
Non-Pollution-Generating Impervious Surface (Selected Snowshed Structure)	2.94	0.00	-2.94
Total	10.74	10.80	0.06

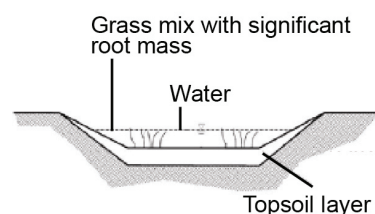
Treatment for the Selected Snowshed would include linear, roadside BMPs, such as media filter drains to treat as much pavement area as practicable. The pavement inside the Selected Snowshed would not receive treatment because precipitation would not fall on the roadway to “wash off” roadway pollutants. Therefore, it is considered a non-pollution-generating impervious surface.

The Proposed Bridges provide more space for additional on-site stormwater treatment facilities between the highway and the rock slope. This space is utilized in the design using two methods of treatment—media filter drains and bioinfiltration ponds. The result is a 3.07-acre increase in the total treated area (Exhibit 3-5).



A media filter drain, shown here, is a linear stormwater treatment and conveyance feature that infiltrates and filters stormwater from highway surfaces.

Not all pollution-generating impervious surface is treatable and treatment is not 100 percent efficient. Remaining pollutants that are discharged from the highway are known as pollutant loads. The 2008 Final EIS concluded that the I-90 project would improve water quality compared to existing conditions because improved treatment of roadway runoff would result in reduced loading (see rows A and B, Exhibit 3-6). The Proposed Bridges would result in higher calculated pollutant-loading than the Selected Snowshed because more pollution-generating impervious surface would be exposed to rainfall (see rows B and C, Exhibit 3-6). The small difference in loading between the Proposed Bridges and the Selected Snowshed is considered negligible (see rows D and E, Exhibit 3-6). Therefore, the conclusions of the 2008 Final EIS that the I-90 project would improve water quality are unchanged.



*Cross section of a bioinfiltration pond.
Polluted water infiltrates through vegetation
and soils into the ground.*

Exhibit 3-6

Pre- and Post-Project Pollutant Loading for the I-90 Project with Selected Snowshed or Proposed Bridges (pounds)

Annual Effluent Load ^{1, 2}	Total Suspended Solids	Total Zinc	Dissolved Zinc	Total Copper	Dissolved Copper
A. Load from existing impervious surface, pre I-90 project	82,603	160.82	58.48	29.24	7.75
B. Load from new and existing impervious surface, post I-90 project with Selected Snowshed	24,112	59.93	28.42	11.85	4.34
C. Load from new and existing impervious surface, post I-90 project with Proposed Bridges	24,280	60.83	29.04	12.06	4.45
D. Difference (I-90 project with Proposed Bridges minus I-90 project with Selected Snowshed)	168	0.90	0.62	0.21	0.11
E. Percent Increase (I-90 project with Proposed Bridges relative to I-90 project with Selected Snowshed)	0.07%	2%	2%	2%	3%

¹ Post-project pollutant loadings do not include additional treatment that will be provided in other off-site locations in or near the I-90 project corridor, consistent with the "equivalent area" approach.

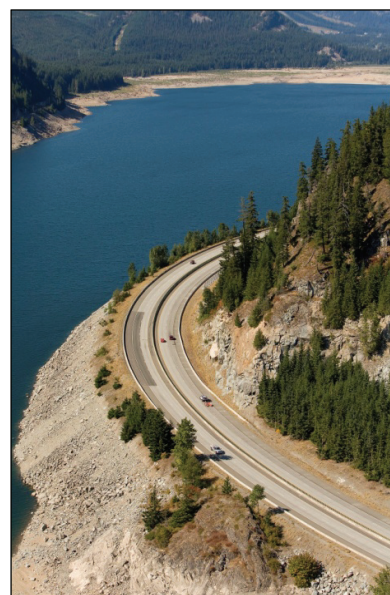
² Pollutant loading is the product of pollutant concentration in the average annual runoff and the volume of runoff. The pollutant concentrations for both options would be similarly reduced because there is a direct relationship between pollutant concentration and pollutant loading from untreated impervious surface and treated stormwater.

Winter Maintenance. Both options would increase the area where traction sand and de-icer are used because both options include one additional lane in each direction that would have to be treated for snow and ice. It is anticipated that the Proposed Bridges would use more de-icer than the Selected Snowshed. In general, de-icer is applied to bridges more frequently than other roadway sections because bridges are prone to icing. In addition, the Selected Snowshed would protect 1,100 feet (0.2 mile) of highway from direct snowfall and therefore may receive less treatment with de-icer.

Washington State Section 303(d) Listings. Keechelus Lake is on the state's 303(d) list for excess quantities of dioxin and polychlorinated biphenyls found in fish tissue. Neither of these manufactured compounds originates from highway construction or runoff. The 2008 Final EIS concluded that construction and operation of the I-90 project with the Selected Snowshed would not impact the 303(d) listing. The Proposed Bridges would not change this conclusion.

Keechelus Lake Reservoir Storage

WSDOT committed to a policy of no net loss to Keechelus Lake's storage capacity because of the I-90 project. To achieve this, approximately 341,000 cubic yards of material were removed from the lake during Phase 1A, an amount that would more than compensate for any fill placed along the lakeshore. The Selected Snowshed would reduce the storage capacity of Keechelus Lake by adding approximately 4,400 cubic yards of fill. In contrast, the Proposed Bridges would increase the storage capacity of the lake by excavating approximately 41,000 cubic yards of rock, resulting in a total difference of 45,400 cubic yards (28 acre feet) compared to the Selected Snowshed. Although each option differs in its impact on lake storage, both options uphold WSDOT's commitment to no net loss and would, therefore, have no adverse impact to the lake.



Water levels in Keechelus Lake fluctuate with its use as an artificial reservoir.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in ongoing revisions to the design of the proposed stormwater treatment systems.

WSDOT's approach to using de-icer primarily involves source control by following application guidelines in the *Statewide Snow and Ice Plan*, which minimizes the use of de-icer (WSDOT 2007a). However, WSDOT cannot entirely eliminate the use of either traction sand or chemical de-icers because both are essential to winter highway safety. The highway design under either option would install grit chambers in the stormwater collection system in an effort to collect and ultimately reduce the amount of traction sand entering waterbodies.

Grit chambers are modified catch basins with enlarged sumps that allow sand to settle out of the stormwater before it is discharged.

Direct construction impacts on Keechelus Lake are minimized under either option by only allowing work near the lake when the water level is low enough to gain access to the site when the work area is dry.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). The BMPs used for construction of Phase 1C were updated to 2011 standards. If the Proposed Bridges are identified as the Preferred Alternative in the Final Supplemental EIS, the commitment to these BMPs would not change. No additional BMPs are required for the Proposed Bridges.

Compensatory Mitigation

Both options have been designed to meet temporary and long-term stormwater standards consistent with the 2008 Final EIS and 2011 *Highway Runoff Manual*. Consequently, neither option would result in permanent adverse impacts to water resources and no compensatory mitigation is required.

3.4 Wetlands and Other Jurisdictional Waters

This section discusses the potential impacts of each option on wetlands and other jurisdictional waters. Additional information is provided in the *Wetlands Technical Update* (Appendix H).

The design modification area is located partially within the USFS Riparian Reserves buffer area, which extends 150 feet from the OHWM of Keechelus Lake. The USFS regulates or prohibits

Jurisdictional waters are aquatic and wetland features that are regulated by federal, state, and local agencies. Jurisdictional waters include both "waters of Washington State" and "waters of the US"

activities that may prevent attainment of the ACS objectives within this area (see Section 3.5), which differs from the regulation of jurisdictional wetland buffers by local agencies.

What has changed since the Record of Decision was issued?

There have been no major changes to wetland regulations since the ROD was issued. However, existing conditions within the design modification area have changed due to clearing activities associated with ongoing construction of Phase 1C. Therefore, the permanent wetland impacts identified in this section have already occurred as previously permitted for the Selected Alternative. Mitigation for impacts to wetland resources for the I-90 project was finalized in the *Final Wetland and Aquatic Resources Mitigation Plan* (WSDOT 2011c).

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Ground disturbance and vegetation clearing during construction of either option would result in temporary impacts to wetland buffers and other jurisdictional waters (Exhibit 3-7). The Selected Snowshed includes temporary impact to 0.25 acre of vegetated wetland buffer. The Proposed Bridges would increase these impacts by 0.06 acre to 0.31 acre. This disturbed buffer is a remnant fringe of riparian vegetation between the high-pool elevation of Keechelus Lake and I-90. Excavation to construct the fill wall for the Selected Snowshed includes temporary impact to 0.43 acre below the OHWM of Keechelus Lake. Excavation of avalanche chutes beneath the Proposed Bridges would increase these excavation impacts by 0.59 acre to 1.02 acres.

The **high-pool elevation** of Keechelus Lake is 2,517 feet AMSL.

The **ordinary high water mark** refers to the highest level reached by a body of water that has been maintained for a sufficient period of time to leave evidence on the landscape. The ordinary high water mark of Keechelus Lake is 2,510 feet AMSL.

Exhibit 3-7**Selected Snowshed and Proposed Bridges Temporary Wetland Impacts (acres)**

Resource	Selected Snowshed	Proposed Bridges	Difference
Wetlands	0	0	0
Wetland (Lakeshore) Buffers	0.25	0.31	0.06
Ditches	0	0	0
Keechelus Lake ¹	0.43	1.02	0.59

¹ This category includes impacts below the OHWM of the lake.

Permanent Impacts

Excavation and wetland fill from either option would result in permanent impacts to wetlands, wetland buffers, ditches, and other jurisdictional waters (Exhibit 3-8). Both options include the permanent fill of two small wetlands and two ditches within the design modification area.

Exhibit 3-8**Selected Snowshed and Proposed Bridges Permanent Wetland Impacts (acres)**

Resource	Selected Snowshed	Proposed Bridges	Difference
Wetlands ¹	0.06	0.06	0
Wetland (Lakeshore) Buffers	1.25	1.19	-0.06
Ditches (acres/linear feet)	0.03/200	0.03/200	0
Keechelus Lake ²	0.40	0.05	-0.35

¹ Includes impacts which have already occurred due to ongoing Phase 1C construction activities.

² This category includes impacts below the OHWM of the lake.

The Selected Snowshed includes permanent impacts to 1.25 acres of disturbed wetland buffer adjacent to Keechelus Lake. The Proposed Bridges reduce these impacts by 0.06 acre to 1.19 acres.

The Selected Snowshed includes permanent impacts to 0.40 acre below the OHWM of Keechelus Lake. The Proposed Bridges would reduce these impacts by 0.35 acre due to the use of support piers instead of a fill wall along the shoreline. Permanent impacts below the OHWM are limited to 0.05 acre of fill associated with the central four piers in the outside row under the eastbound bridge (Exhibit 3-9). The excavation of avalanche chutes for the Proposed Bridges would result in a 1.28-acre increase in the nearshore habitat of the reservoir below the OHWM (Exhibit 3-9), which would provide beneficial effects for aquatic species (see Section 3.5). In doing so, WSDOT meets a commitment to the USFS under the ACS objectives.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in the design of the Proposed Bridges, which would reduce impacts to Keechelus Lake when compared to the Selected Snowshed through the use of piers instead of a fill wall.

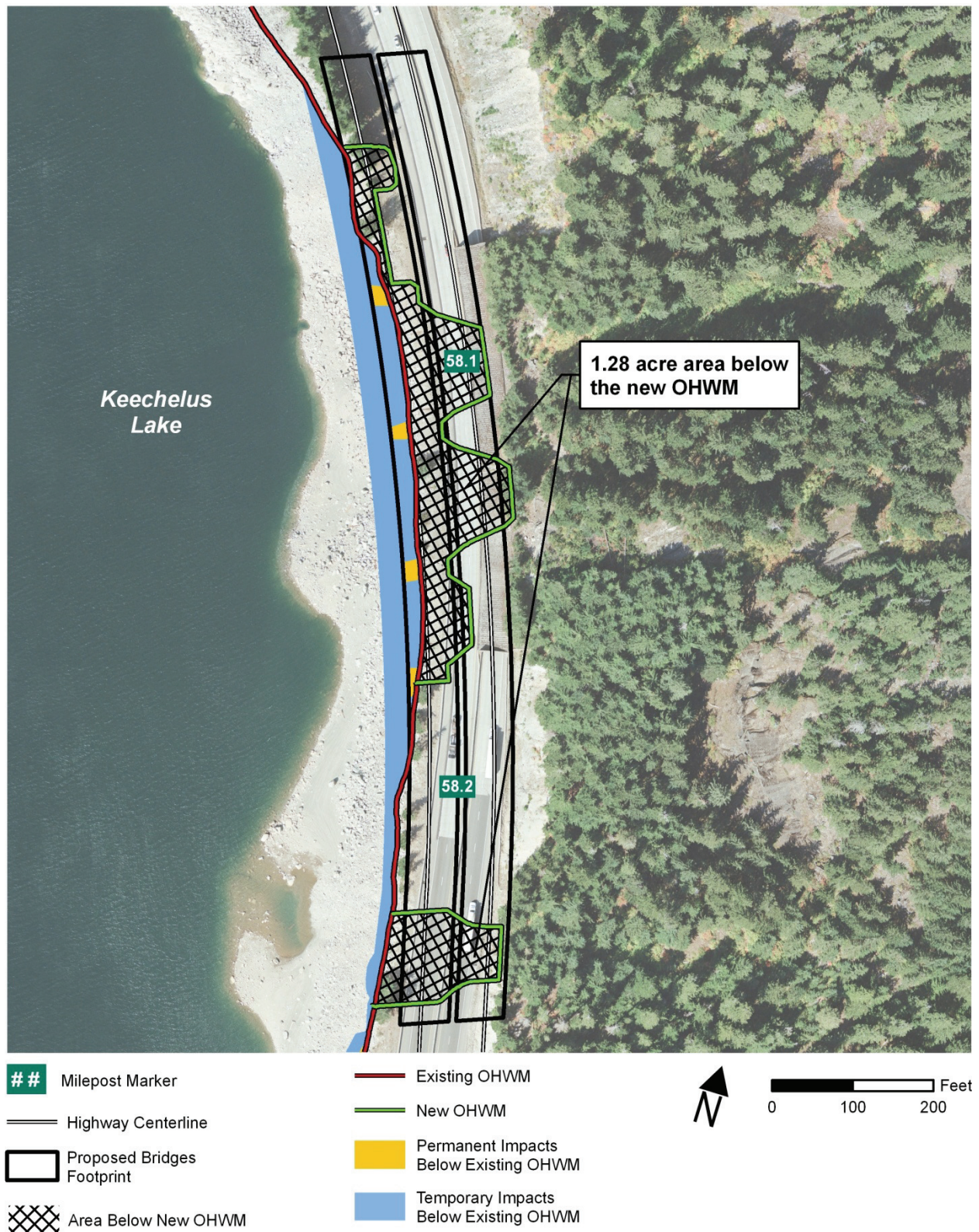
Because the difference between the Proposed Bridges and the Selected Snowshed is negligible and the Proposed Bridges have less permanent impacts to jurisdictional waters, an additional 404(b)(1) analysis is not warranted.

Best Management Practices

The Proposed Bridges would require modification and re-issuance of aquatic resource permits (for example, Sections 401 and 404 of the Clean Water Act and Hydraulic Project Approval) if deemed appropriate by regulatory agencies. These resource permits would stipulate conditions to further avoid and minimize temporary impacts to wetlands and other jurisdictional waters during construction.

WSDOT would adhere to all of the stipulated conditions in addition to those BMPs identified in the 2008 Final EIS, which address the impacts of the Selected Snowshed (Appendix F).

Exhibit 3-9
Proposed Bridges Impacts to Keechelus Lake



Compensatory Mitigation

Compensatory mitigation to address the impacts of the I-90 project with the Selected Snowshed is provided in Appendix F, including preparation of a *Final Wetland and Aquatic Resources Mitigation Plan* (WSDOT 2011c). The Proposed Bridges would reduce permanent impacts to jurisdictional waters compared to the Selected Snowshed. Therefore, no additional measures to mitigate for impacts to wetland resources or other jurisdictional water are required.

3.5 Fish, Aquatic Species, and Habitats

This section discusses the potential impacts of each option on aquatic species and habitat. Wetlands and other waters were previously discussed in Section 3.4. Additional information on aquatic species and habitat is provided in the *Aquatic Species Technical Update* (Appendix I).

The existing aquatic habitat and species within the design modification area are described in detail in the 2005 Draft EIS and 2008 Final EIS and supporting documentation, including the *Aquatic Species Discipline Report* (WSDOT 2002) and the *Biological Assessment* (WSDOT 2008c).

In addition to discussing impacts to fish and aquatic habitats, this section also includes impacts to Riparian Reserves, as identified in the ACS. The ACS is the element of the Northwest Forest Plan that was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. One intent of the strategy is to protect salmonid fish habitat on federal lands. Riparian Reserves are the portions of watersheds where ACS objectives receive primary emphasis. These are areas critical to maintaining hydrological, geomorphic, and ecological processes.

Most Riparian Reserves are associated with streams, but they also include wetlands, lakes, and reservoirs. The design modification area is located partially within a USFS Riparian Reserves buffer area, which extends 150 feet from the OHWM of Keechelus Lake. The USFS regulates or prohibits activities that may prevent attainment of ACS objectives within this area.

Riparian Reserves are administrative buffer areas established around springs, streams, wetlands, ponds, lakes, and potentially unstable areas.

What has changed since the Record of Decision was issued?

On November 17, 2010, the USFWS officially designated and modified bull trout critical habitat throughout the range of the species under Section 7 of the Endangered Species Act (ESA). This designation included Keechelus Lake. FHWA and WSDOT are in formal consultation with USFWS regarding this designation for the entire I-90 project. This consultation is anticipated to be completed in late 2012.

The affected environment for aquatic species as described in Section 3.5 of the 2008 Final EIS has not changed.

Section 7 of the Endangered Species Act requires federal agencies to consult with the USFWS if they determine that any actions they authorize, fund, and/or conduct may affect any federally proposed or listed species, or result in destruction or adverse modification of their critical habitat.

Critical habitat is defined as specific area(s) essential to the conservation of the species.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Temporary impacts to aquatic habitat may include construction stormwater runoff from excavation, work below the high-pool elevation of Keechelus Lake (2,517 feet AMSL), and blasting. Construction stormwater runoff, including hillside drainage, is addressed by appropriate implementation of BMPs as described in the 2008 Final EIS and *Conceptual and Final Wetland and Aquatic Resource Mitigation Plans* (WSDOT 2008d and 2011c). These BMPs include high-visibility construction exclusion fencing and erosion and sedimentation control measures. Impacts to aquatic species from construction stormwater runoff are the same for both options. Potential impacts associated with temporary work below high-pool elevation and blasting are described in more detail below.

Work below the High-Pool Elevation

Construction of the Selected Snowshed would result in temporary impacts to 0.57 acre below the high-pool elevation of Keechelus Lake (Exhibit 3-10). The Proposed Bridges would require more extensive temporary impacts (1.43 acres) below the high-pool elevation of Keechelus Lake, primarily due to the excavation of the avalanche chutes. Because excavation of the engineered avalanche chutes would occur when the lake is drawn down and the work area is dry, temporary impacts to aquatic life are limited to minor, temporary turbidity that would be produced following the first contact of the excavation area by precipitation or wave action

following construction. However, as most of the substrate in this location is rock, the risk of temporary turbidity impacts is considered negligible.

Exhibit 3-10

Temporary Impacts Below High-Pool Elevation of Keechelus Lake (acres)

Area	Selected Snowshed	Proposed Bridges	Difference
Area below high-pool elevation (2,517 feet AMSL)	0.57	1.43	0.86

Blasting

Blasting is harmful to fish life when it occurs close to fish-bearing waters. The acoustic shock associated with blasting is transferred to aquatic habitat through air and ground vibration. Post-detonation compressive shock waves can injure or kill fish through rupture and hemorrhage of vital organs. Blasting can also disturb aquatic life without causing physical injury. The closer blasting occurs to the water, the greater the risk to fish. The extent of blasting upslope of I-90 is similar for both options and would not impact fish life.

All shoreline blasting would occur on dry land while the lake is drawn down to lower levels. Blasting associated with rock excavation for the Proposed Bridges has the potential to occur closer to the lake (within 100 feet of the water) than the blasting associated with the Selected Snowshed, increasing risks to aquatic life. Juvenile and adult fish using nearshore areas at the time of blasting could leave the immediate area due to noise and vibration, but would return shortly after the blast event.

It is important to note that neither option would use blasting to install pier columns. Both options would install pier columns using drilled shafts, which would not impact fish life. This analysis may be updated based upon the results of ongoing consultation with USFWS. Any updated results will be included in the Final Supplemental EIS.



Blasting of rock would be required to construct either option.

Permanent Impacts

Work below the High-Pool Elevation

The Proposed Bridges would result in substantially less permanent impact below the existing high-pool elevation of Keechelus Lake due to the installation of piers to support the Proposed Bridges instead of a continuous wall to support the outer edge of the Selected Snowshed. Excavation of the avalanche chutes for the Proposed Bridges would increase the area of aquatic habitat below the high-pool elevation by 2.22 acres (Exhibit 3-11). This area would likely provide additional foraging and daily movement opportunities for any fish, amphibians, insects, and other aquatic species that may use the nearshore areas of the lake during high-pool in the spring and early summer, when the lake is not frozen. Fish species could include bull trout (*Salvelinus confluentus*), cutthroat trout (*Oncorhynchus clarkii*), rainbow trout (*Oncorhynchus mykiss*), mountain whitefish (*Prosopium williamsoni*), burbot (*Lota lota*), and northern pikeminnow (*Ptychocheilus oregonensis*). The creation of additional aquatic habitat meets a commitment to the USFS under the ACS objectives.

Exhibit 3-11

New Aquatic Habitat in Keechelus Lake (acres)

Area	Selected Snowshed	Proposed Bridges	Difference
Area at high-pool elevation (2,517 feet AMSL)	0	2.22	2.22

In addition to the beneficial effect of additional nearshore habitat for general aquatic species, excavation of the avalanche chutes underneath the Proposed Bridges would create an additional 2.22 acres of habitat for the threatened bull trout population that lives in Keechelus Lake (Exhibit 3-11). During the late spring and early summer months when the lake is at high pool, this area would provide additional foraging habitat for bull trout.

Removal of Riparian Vegetation

The Proposed Bridges would remove almost the same amount of riparian vegetation as the Selected Snowshed (see Section 3.4). Therefore, impacts to aquatic species due to the removal of riparian vegetation are similar for both options. Creation of new aquatic area



The Proposed Bridges would create nearshore aquatic habitat in the lake at high-pool elevation (design visualization).



The Selected Snowshed would remove aquatic habitat in the lake at high-pool elevation (design visualization).



An isolated population of bull trout lives in Keechelus Lake.

along the shoreline of Keechelus Lake with the Proposed Bridges would provide an opportunity for both passive and active establishment of riparian vegetation in areas that would not exist under the Selected Snowshed. These new riparian vegetation areas would provide new foraging areas for aquatic species during high-pool levels in the spring and early summer.

Stormwater Runoff

As discussed in Section 3.3, the Proposed Bridges would generate a small increase in pollutant loading from the increased amounts of pollution-generating impervious surfaces. This additional stormwater runoff may result in minor behavioral impacts to fish in close proximity to outfalls in the design modification area. However, implementation of enhanced stormwater treatment in previously untreated areas for the I-90 project would make these impacts negligible. Impacts to aquatic species from stormwater runoff are not substantially different for either option.

As discussed in Section 3.3, both options increase the area where traction sand and de-icers are used and it is anticipated that the Proposed Bridges would require more de-icer than the Selected Snowshed. Based upon the small concentrations of constituent contaminants in de-icer, both options would result in negligible impacts to aquatic species.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in the design of the Proposed Bridges, which would reduce impacts to Keechelus Lake through the use of piers instead of a fill wall.

Construction of the Proposed Bridges would adhere to previous commitments made during preparation of the 2008 Final EIS to avoid impacts from blasting and in-water work. These include, but are not limited to, the following:

- Limit the size of blast charges such that acoustic shock in Keechelus Lake fish habitat will be less than the threshold

recommended in the literature (100 kilopascal) (Wright and Hopky 1998).

- No work, including work bench excavation, drilling for pier column shafts, or rock excavation, will be conducted in the lake, but will occur when the lake level is drawn down to an elevation below that of the work area (WSDOT 2008c).

Best Management Practices

WSDOT committed to using a wide range of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). The BMPs used for construction of Phase 1C were updated to 2011 standards. Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required. However, the Proposed Bridges would require modification and re-issuance of aquatic resource permits (for example, Sections 401 and 404 of the Clean Water Act and Hydraulic Project Approval). These resource permits would stipulate conditions to be used during construction to avoid and minimize impacts to aquatic species and habitat, including Washington State Department of Ecology mixing zone requirements. These permits may also include stipulations associated with vegetation establishment in new aquatic habitat along the shoreline, which would meet a commitment to the USFS ACS objectives. Additional commitments that affect aquatic habitats and species could also result from ongoing consultation with USFWS regarding bull trout in Keechelus Lake. WSDOT would adhere to all stipulated conditions and commitments.

Compensatory Mitigation

Neither option is expected to result in permanent adverse impacts to fish, aquatic species, and habitat. Therefore, no compensatory mitigation is required.

3.6 Terrestrial Species

This section discusses the potential impacts of each option on terrestrial species. Additional information is provided in the *Terrestrial Resources Technical Update* (Appendix J).

What has changed since the Record of Decision was issued?

Gray wolves (*Canis lupus*) have extended their range in Washington State since the ROD was issued. Gray wolves in the eastern one-third of the state were delisted from protection under the ESA, but they are still listed in the vicinity of the I-90 project. Breeding gray wolves are now within approximately 15 miles east of the I-90 project, which increases the likelihood that gray wolves may be encountered within the design modification area during construction.

On March 8, 2012, the USFWS proposed revisions related to critical habitat for the northern spotted owl (*Strix occidentalis caurina*). This proposal could designate critical habitat for the owl within the entire I-90 project area. A final decision by the USFWS on this designation is anticipated in November of 2012. The ESA consultation re-initiation for the Proposed Bridges will evaluate this proposed designation in greater detail.

Construction of Phase 1C is ongoing as previously permitted, including some clearing activities for the Selected Alternative within the design modification area. Therefore, some impacts identified in this section associated with the Selected Snowshed may have already occurred.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Temporary impacts to terrestrial species and habitat are identified in Exhibit 3-12. Noise during construction and removal of habitat for staging, stockpiling, and equipment access would result in temporary impacts to wildlife habitat under both options. The Selected Snowshed includes temporary impacts to 2.32 acres of terrestrial habitat, while the Proposed Bridges would impact 0.22 acre more habitat, for a total of 2.54 acres. Temporary impact areas include areas that would be revegetated following completion of construction.



Gray wolves are not common in the I-90 project area, but their presence cannot be ruled out.

Exhibit 3-12**Selected Snowshed and Proposed Bridges Temporary Terrestrial Habitat Impacts (acres)**

Habitat Type	Selected Snowshed	Proposed Bridges	Difference
Early Successional Forest	0.22	0.03	-0.19
Mid Successional Forest	0.13	0.11	-0.02
Mature Forest	1.38	1.78	0.40
Rock	0.59	0.62	0.03
Total	2.32	2.54	0.22

Includes impacts associated with the Selected Alternative which may have already occurred due to ongoing Phase 1C construction activities.

Temporary impacts to mature forest would require an extended length of time (80 years) for regrowth. In the meantime, these areas would still provide wildlife habitat function but would not exhibit mature forest characteristics such as multiple canopy layers and high vegetative structure.

Noise from construction of either option, particularly from blasting, has the potential to disrupt normal wildlife behavior, including foraging and breeding activities. These impacts are similar in duration and type for both options.

Permanent Impacts

The Selected Snowshed includes permanent impacts to 4.45 acres of terrestrial habitat, including 1.97 acres of mature forest (Exhibit 3-13). The Proposed Bridges would impact up to an additional 3.26 acres of total terrestrial habitat, including an additional 2.28 acres of mature forest located upslope of the Existing Snowshed, for a total of 7.71 acres. These habitat impacts could affect both listed and other terrestrial species, which are described in more detail below.

Exhibit 3-13**Selected Snowshed and Proposed Bridges Permanent Terrestrial Habitat Impacts (acres)**

Habitat Type	Selected Snowshed	Proposed Bridges	Difference
Early Successional Forest	0.35	0.78	0.43
Mid Successional Forest	0.02	0.43	0.41
Mature Forest	1.97	4.25	2.28
Rock	2.11	2.25	0.14
Total	4.45	7.71	3.26

Includes impacts associated with the Selected Alternative which may have already occurred due to ongoing Phase 1C construction activities.

Listed Species

Wolves, grizzly bear (*Ursus arctos*), and Canada lynx (*Lynx canadensis*) are listed under the ESA and may occur in the vicinity of the I-90 project on a transient basis, but no active reproducing populations are known to occur near the design modification area. These large carnivores are much more likely to use areas such as Gold Creek near the north end and Price/Noble Creek near the south end of Keechelus Lake as movement corridors. No suitable habitat for other listed species, including Ute ladies'-tresses (*Spiranthes diluvialis*) and marbled murrelet (*Brachyramphus marmoratus*), exists in the design modification area. For these reasons, no adverse impacts to these listed species are anticipated.

The mature forest habitat within the design modification area provides potential dispersal habitat for northern spotted owl. However, the potential for spotted owl use of this habitat is unlikely due to ongoing human disturbance. No spotted owl nesting is documented in the vicinity of the I-90 project. Although both options could impact individual owls foraging or moving through the area, substantial adverse impacts on the local population of northern spotted owls are not anticipated.

Other Species

Terrestrial species closely associated with mature upland forest are the most likely affected because the Proposed Bridges would impact their primary habitat. These include species such as pine marten (*Martes martes*), fisher (*Martes pennanti*), pileated woodpecker

(*Dryocopus pileatus*), Vaux's swift (*Chaetura vauxi*), and northern goshawk (*Accipiter gentilis*).

Most of these species are not expected to occur in proximity to I-90 due to the high level of habitat fragmentation and human disturbance. Also steep rocky slopes and noise from I-90 make the design modification area unlikely habitat for most of these species. USFS staff conducted a site visit on July 23, 2012, and determined that there is a low likelihood of rare species occurrence within the design modification area. The USFS also determined that surveys for mollusk, vascular plant, lichen, bryophyte, and fungi cannot be completed safely within the design modification area due to the steep rocky terrain (P. Garvey-Darda, pers. comm., July 23, 2012). Construction of the Proposed Bridges would reduce the amount of available potential habitat for these species in the short-term compared to the Selected Snowshed.

Mule deer (*Odocoileus hemionus*), black bear (*Ursus americanus*), cougar (*Puma concolor*), elk (*Cervus canadensis*), olive-sided flycatcher (*Contopus cooperi*), merlin (*Falco columbarius*), neotropical migratory birds, and many bat species have more general habitat requirements and may occur within the design modification area. However, habitat for these species is not limited in the vicinity of the I-90 project.

Wildlife Movement

Neither option would impact any designated connectivity emphasis areas or hydrologic connectivity zones. All of the existing crossing areas important to wildlife are at existing creek corridors located either east or west of the design modification area. Within the design modification area, the location of both options between the steep slopes to the east and Keechelus Lake to the west would minimize the use of this area by wildlife.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable.

Hydrologic connectivity zones are geographic zones where connections between groundwater and surface water play an important role in maintaining natural flow paths which transmit water, sediment and nutrients in support of aquatic organisms and sustaining streamflow.

WSDOT committed to a wide range of avoidance and minimization measures for terrestrial species on the I-90 project, including adjustment of designs to avoid mature forest, riparian areas, and wetlands; acquisition of offsite properties for habitat preservation; construction of wildlife crossing structures; and implementation of a wildlife monitoring plan (see the *Wildlife Monitoring Plan* [WSDOT 2008e]). No additional avoidance and minimization measures specific to the Proposed Bridges are proposed for terrestrial species. However, WSDOT expects that as the design is completed, impacts to terrestrial habitat can be reduced further, and that the impacts presented herein represent the worst case.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required.

Compensatory Mitigation

Compensatory mitigation to address the impacts of the I-90 project with the Selected Snowshed is provided in Appendix F. The I-90 project mitigates for unavoidable impacts to terrestrial species through the beneficial effects of the Selected Alternative, which includes improved ecological connectivity, an increase in riparian habitat, and a decrease in wildlife mortality. Consequently, neither option would result in substantial adverse impacts to terrestrial species. No additional compensatory mitigation is required.

3.7 Transportation

This section discusses the potential impacts of each option on transportation. Additional information on transportation is provided in the *Transportation Technical Update* (Appendix K).

What has changed since the Record of Decision was issued?

No substantive changes have occurred to the I-90 project's transportation goals and requirements since the ROD was issued.

The affected environment for transportation as described in Section 3.7 of the 2008 Final EIS has not changed.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

WSDOT has committed to keeping two lanes of traffic open in both directions during peak travel times throughout construction of the I-90 project. Temporary closures and lane restrictions would typically be limited to low traffic periods (Monday through Thursday). This commitment applies to both options. Construction of the Selected Snowshed would require work over the highway. This would result in more temporary closures than would be required for the Proposed Bridges.

The Proposed Bridges require more excavation to construct than the Selected Snowshed. However, much of the extra material excavated from the adjacent hillside will be used on-site as fill material for the bridge approaches (J. Yamaura, pers. comm., August 20, 2012). This will limit the need for hauling to and from the site, resulting in minimal impacts to traffic.

As discussed in Section 3.2, construction of either option would include one winter without structural avalanche protection following removal of the Existing Snowshed. During this winter, WSDOT would increase preventative avalanche control, which may result in more frequent road closures. While the roadway alignment for each option may differ during construction, there is no substantial difference in the anticipated frequency or duration of road closures for avalanche control for either option.

Permanent Impacts

Road Closures

Minimizing road closures related to avalanches and rock fall is an important element of the I-90 project purpose and need. As discussed in Section 3.2, both options are designed to minimize avalanches from impacting the traveling public and eliminate the need for active avalanche control and road closures for typical avalanche events. During severe snow storms, WSDOT has the ability to close the

highway if safety warrants it, but such circumstances are extremely rare.

The two options use different approaches to address unstable slopes, as described in Section 3.2. Even though the options differ in their approach to slope stabilization, both would reduce highway closures due to rock fall.

Transportation Safety

The I-90 project was designed to increase transportation safety by increasing capacity, straightening highway sections, providing wider shoulders, and improving wildlife crossings. In some respects, the design of the Proposed Bridges improves transportation safety more than the Selected Snowshed, which shares some of the “operational difficulties” as the tunnel alternatives analyzed in the 2005 Draft EIS and 2008 Final EIS. Operational difficulties include the need for specialized emergency response equipment and requirements associated with hazardous and flammable materials (WSDOT 2008a).

As discussed in the 2008 Final EIS, Snoqualmie Pass averages nearly 450 inches of rain and snow each year, making the travel lanes slippery and limiting visibility. Other hazards created by heavy precipitation include ice, flooding, avalanches, and rock slides (WSDOT 2008a). WSDOT actively maintains the corridor to reduce the potential for accidents associated with these conditions. The Selected Snowshed and the Proposed Bridges both have the potential for icy conditions, similar to other structures within the I-90 project area. Ice could form at the entrance or exit of the Selected Snowshed where the pavement transitions from wet to dry conditions. Ice could also form on the bridge structures due to cold air above and below the bridge deck.

Neither option includes a sustained grade that presents a risk to the traveling public when conditions are icy. Exhibit 3-14 compares the design features of the Selected Snowshed and the Proposed Bridges to two other bridge structures within the I-90 project area, all of which are designed in compliance with American Association of State Highway and Transportation Officials and WSDOT design guidelines. The maximum vertical grade for the Proposed Bridges is 2.6 percent, which is less than the maximum vertical grade of 4.1 percent used elsewhere on the I-90 project (west of the Resort Creek Bridge). The most substantial curve associated with the Proposed



Unstable slopes cause damage to the highway, put motorists at risk, and can cause delays.



WSDOT actively maintains the I-90 corridor to ensure the safety of the traveling public.

The **vertical grade** is the amount of inclination of a roadway. A higher vertical grade indicates a steeper road.

The **cross slope** is the horizontal or lateral (cross) slope of a roadway.

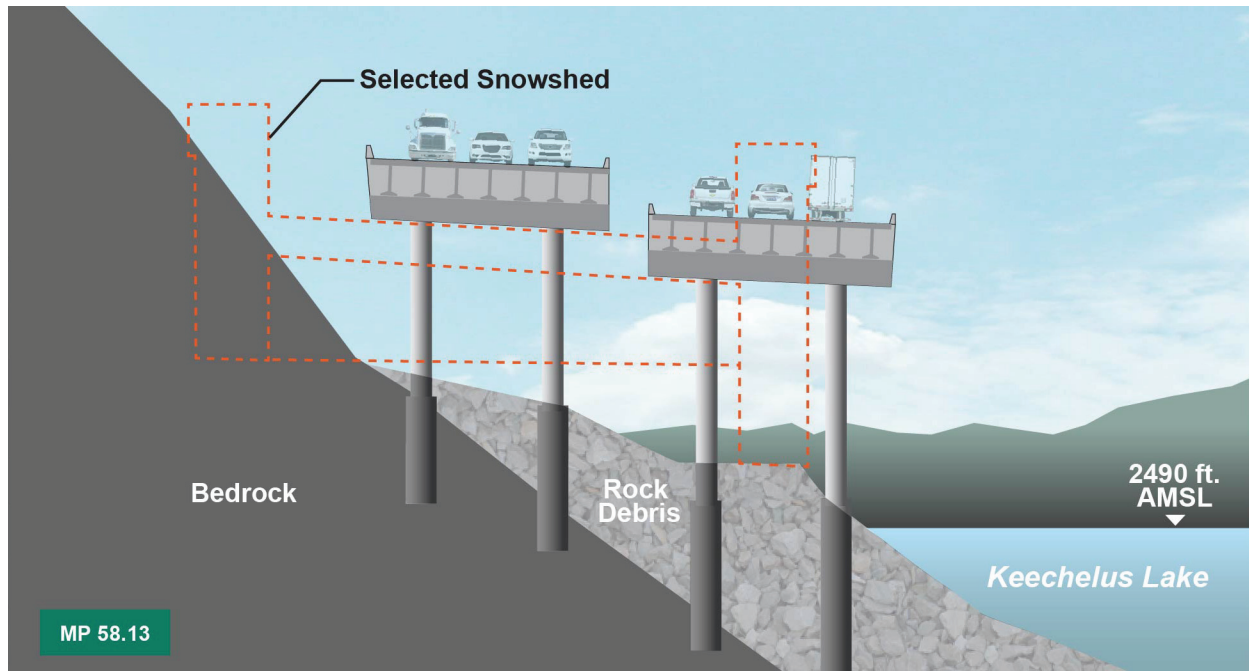
Bridges is a 5 percent cross-slope, which is flatter than the 6 percent cross-slope for the Selected Snowshed (Exhibit 3-15). Overall, the curves associated with both options are comparable to the curves of other structures throughout the I-90 corridor and do not present a safety risk to the traveling public.

Exhibit 3-14
Structural Design Comparison

Structure	Maximum Height ¹	Length	Maximum Vertical Grade	Maximum Cross-Slope
Selected Snowshed	n/a	1,100 ft	2.3%	6%
Proposed Bridges	75 ft	1,200 ft	2.6%	5%
Gold Creek Bridges	33 ft	930 ft/1,085 ft	0.7%	4%
Slide Curve Bridge	55 ft	1,152 ft	0.7%	5%

¹ Height is measured from the top of the bridge deck at the centerline of the bridge to the ground surface.

Exhibit 3-15
Cross Section Comparison of the Selected Snowshed and Proposed Bridges



For either structure, WSDOT would monitor road conditions, plow the road, and apply traction sand and de-icer when needed to minimize the potential hazards. These activities would be similar to the preventative maintenance WSDOT performs on many other structures throughout the corridor.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT committed to keeping two lanes of traffic open in both directions during peak travel times throughout construction in the 2008 Final EIS. WSDOT would uphold this commitment for either option.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required.

Compensatory Mitigation

Neither option would result in permanent adverse impacts to transportation. Therefore, no compensatory mitigation is required.

3.8 Land Use

This section discusses the potential impacts of each option on land use. Additional information on land use is provided in the *Land Use Technical Update* (Appendix L).

What has changed since the Record of Decision was issued?

Existing land use conditions have changed due to ongoing construction activities associated with Phase 1C of the I-90 project. There have also been updates to local plans and state environmental procedures. Kittitas County has updated its *Comprehensive Plan* (Kittitas County 2011) since the ROD was issued. The WSDOT *Environmental Procedures Manual* (EPM) is also updated on a

regular basis. The June 2011 update to the EPM merged six former EPM chapters into one, Chapter 450, Land Use (WSDOT 2011d).

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

In August 2009, the USFS approved a 36.52-acre right-of-way easement for the I-90 project with the Selected Snowshed. This easement included a 0.42-acre easement on Kittitas County Tax Parcel No. 918735. This parcel was privately owned at one time, but as a result of land exchange, is now part of the National Forest. Temporary and permanent land use impacts on that parcel are identified in Exhibit 3-16.

Exhibit 3-16

Selected Snowshed and Proposed Bridges Land Use Impacts (acres)

Impact	Kittitas County Tax Parcel Number	Ownership	Selected Snowshed	Proposed Bridges	Difference
Temporary ¹	918735	Public	0	1.12	1.12
Permanent ^{1,2}	918735	Public	0	1.07	1.07

¹ Temporary and permanent impacts include areas outside of current right-of-way easement areas.

² Permanent impacts for the Proposed Bridges include right-of-way easement areas, which are subject to change during final design. The USFS will determine the final easement area.

Temporary Impacts

Construction of the Selected Snowshed would occur entirely within the current right-of-way easement area. Construction-related activities for the Proposed Bridges would increase temporary land use impacts by 1.12 acres on Parcel No. 918735 (Exhibit 3-16). Section 7 of the Memorandum of Understanding (MOU) between WSDOT and the USFS indicates that use or occupancy of National Forest System lands for other highway-related uses outside easement areas will require a USFS-issued Special Use Permit. WSDOT would obtain a Special Use Permit or amend an existing permit prior to construction.

Permanent Impacts

Land Acquisitions for New Highway Right-of-Way

The Proposed Bridges would require additional right-of-way easement of approximately 1 acre on Parcel No. 918735 managed by USFS (Exhibits 3-16 and 3-17). The procedure for granting an easement modification would be the same for the Proposed Bridges as it was for the I-90 project with the Selected Snowshed.

The 2008 Final EIS concluded that the land acquisitions and easements needed for new highway right-of-way would not change the existing land use patterns or ownership outside of the right-of-way, nor would they be incompatible with adjacent land uses. The minor amount of additional right-of-way easement needed for the Proposed Bridges would not change this conclusion. Lastly, all easements would involve public land, and there are no impacts to privately-owned land.

Compatibility with Existing Land Use Regulations

The USFS issued a consistency determination on August 18, 2009, indicating that the I-90 project with the Selected Snowshed is consistent with USFS land management plans. The use of an additional acre of USFS land for the Proposed Bridges is minimal when compared to the 36.52 acres already transferred for the entire I-90 project. Based on discussions with USFS to date, it is anticipated that USFS would also determine that the Proposed Bridges are consistent with USFS management plans, contingent upon review and approval of final construction and design plans.

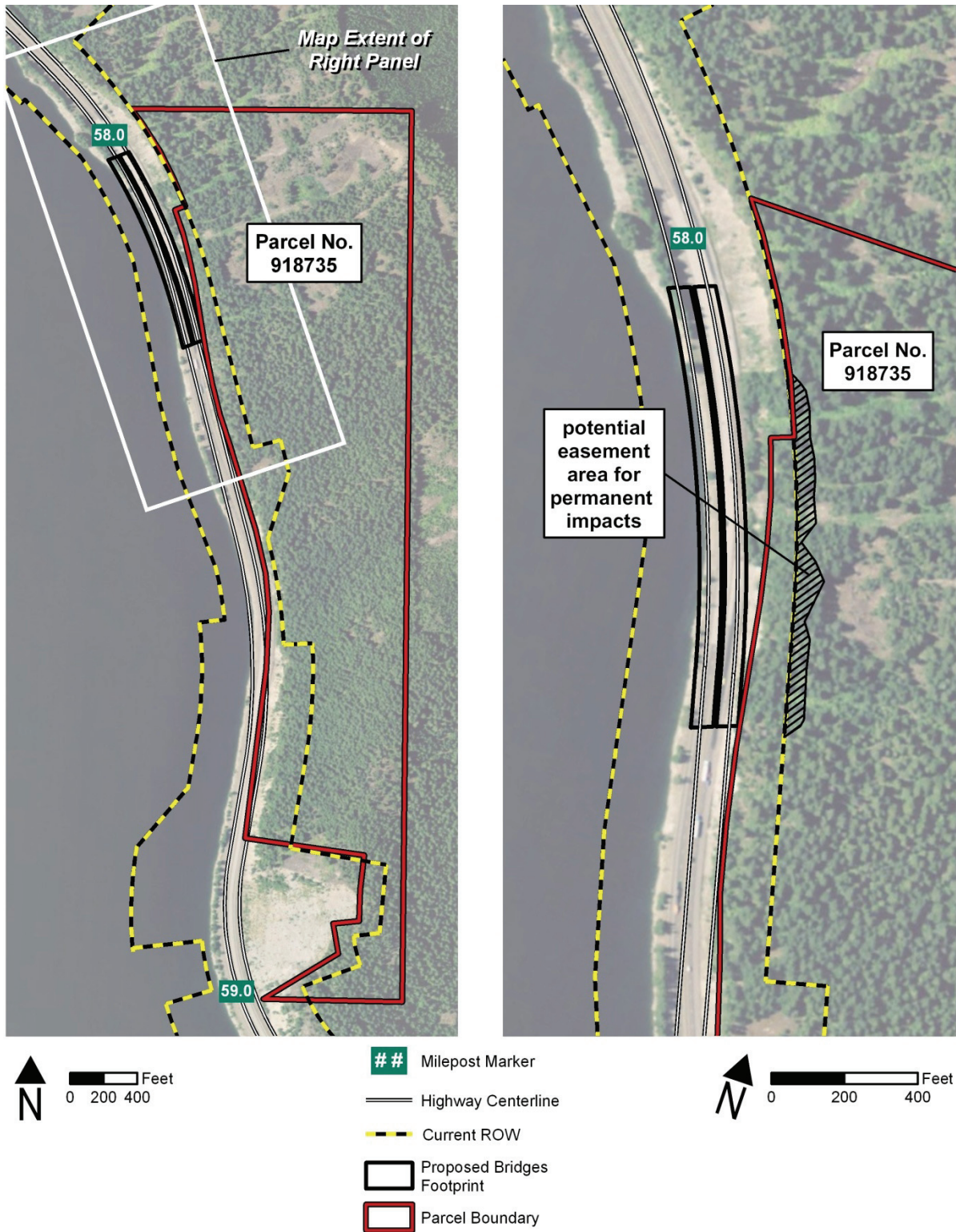
Kittitas County issued all requested permits to WSDOT for the I-90 project, indicating that it is consistent with its land use regulations. The Proposed Bridges would alter the land use on an additional acre of public land compared to the Selected Snowshed. Construction of either option would occur within the Keechelus Lake shoreline and critical areas regulated by Kittitas County. Given the minor change in impacted acreage with the Proposed Bridges and the location of this acreage, it is anticipated that Kittitas County would determine that the Proposed Bridges are also consistent with their land use regulations.

Acquisition of easements on USFS land is governed by two MOUs between the USFS, WSDOT, and FHWA. The MOUs, which outline the procedure for processing land transfers, are summarized in Section 1.13 of the 2008 Final EIS.

Kittitas County's Critical Areas Ordinance (1994) identified critical areas as:

- Wetlands
- Areas with a critical recharging effect on aquifers used for potable water
- Fish and wildlife conservation areas
- Frequently flooded areas
- Geologically hazardous areas

Exhibit 3-17
Proposed Bridges Additional Right-of-Way Easement



How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable. This is evident in the design footprint of the Proposed Bridges, which has been reduced to minimize additional land acquisitions.

Best Management Practices

No BMP-related commitments were made in the 2008 Final EIS for the I-90 project with the Selected Snowshed, and none are proposed for the Proposed Bridges.

Compensatory Mitigation

Compensatory mitigation to address land use impacts of the I-90 project with the Selected Snowshed is summarized in Appendix F. However, the commitment is not relevant within the design modification area. No additional compensatory mitigation measures are expected for the Proposed Bridges.

3.9 Visual Quality

This section discusses the potential impacts of each option on visual quality. The study area for visual analysis extends beyond the design modification area to include key views both from and towards the highway. Additional information is provided in the *Visual Quality Technical Update* (Appendix M).

What has changed since the Record of Decision was issued?

There have been no major changes to visual regulations or guidance since the ROD was issued. However, existing visual conditions have changed due to construction activities associated with Phase 1B of the I-90 project immediately west of the study area and clearing activities associated with Phase 1C occurring to the west.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

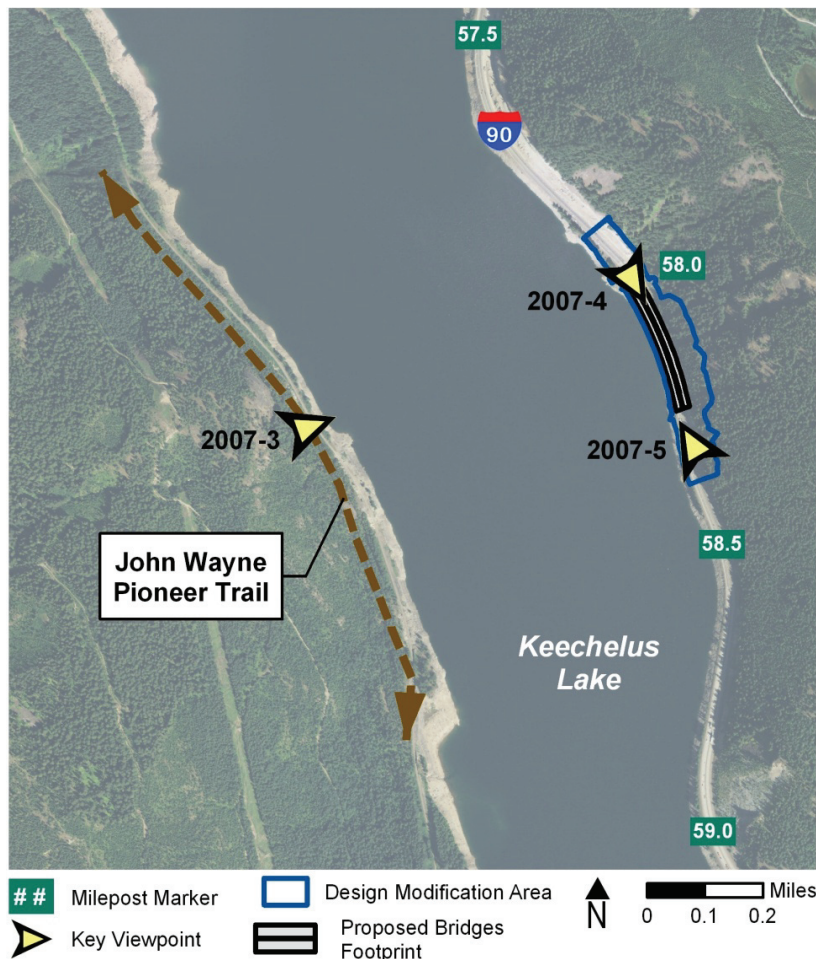
Temporary Impacts

Construction of either option would result in similar temporary visual impacts.

Permanent Impacts

There are three key views within the study area (Exhibit 3-18). Complete descriptions of the visual analysis of existing conditions at these key views are provided in the *Visual Discipline Report Supplement* (WSDOT 2007b). The visual quality rating system considers three factors in determining visual quality: vividness, intactness, and unity. Each factor is rated on a scale of 1 to 7, with 7 representing the most desirable conditions. The total visual quality rating is a numerical average of the three ratings.

Exhibit 3-18
Visual Quality Key Views



What do the Total Visual Quality Rating numbers mean?

- 7 – Dramatic, Pristine Natural Environment with water, mountains, and mature vegetation, or superb example of built environment in dramatic physical setting.
- 6 – Very High
- 5 – High
- 4 – Moderately High
- 3 – Average
- 2 – Moderately low
- 1 – Low

The Selected Snowshed would increase visual ratings at the two key views on I-90 and decrease visual ratings at the key view from the John Wayne Pioneer Trail (Exhibit 3-19). The Proposed Bridges would increase the ratings for one key view on I-90, resulting in a minor beneficial effect. Ratings for two key views would decline with the Proposed Bridges, resulting in minor permanent adverse impacts.

Exhibit 3-19

Visual Quality Ratings for the Selected Snowshed and Proposed Bridges

Key View	Location	Existing	Selected Snowshed	Proposed Bridges	Difference ^{1, 2, 3}
2007-3	View from the John Wayne Pioneer Trail	5.5	5.3	5.2	-0.3
2007-4	View eastbound from MP 58.0	5.1	5.7	4.3	-0.8
2007-5	View westbound from MP 58.3	4.7	5.3	5.6	0.9
Average		5.1 (High)	5.4 (High)	5.0 (High)	-0.4

¹ Difference between the Proposed Bridges and existing conditions.

² A negative number is less desirable and represents a decrease in total visual quality; a positive number represents an increase in total visual quality.

³ Differences of less than 1.0 in visual quality ratings between existing and proposed are not considered a substantial visual impact.

The average existing visual quality for the three impacted key views is 5.1. The Selected Snowshed would increase average visual quality at these key views to 5.4, while the Proposed Bridges would slightly reduce visual quality to 5.0. The Proposed Bridges result in a minor overall reduction in visual quality compared to the Selected Snowshed because intactness and unity ratings would decline as a result of increased signs of development and removal of existing vegetation for the avalanche chutes. WSDOT does not consider a total visual quality rating change of less than 1.0 a substantial visual impact. Therefore, the Proposed Bridges would not result in any substantial adverse impacts to visual quality.

For consistency with analyses in the 2008 Final EIS, results for Key View 2007-3 are based on the 2007 photograph from the John Wayne Pioneer Trail. Exhibit 3-20 shows design simulations of the Selected Snowshed and Proposed Bridges on a more recent photo.

Exhibit 3-20

Visual Comparison of the Selected Snowshed and the Proposed Bridges from Key View 2007-3



The Selected Snowshed, as seen from the John Wayne Pioneer Trail (design visualization with lake elevation at 2,465 feet AMSL). The visual quality rating of the Selected Snowshed from this viewpoint is 5.3 (High).



The Proposed Bridges, as seen from the John Wayne Pioneer Trail (design visualization with lake elevation at 2,465 feet AMSL). The visual quality rating of the Proposed Bridges from this viewpoint is 5.2 (High).

The USFS manages changes in views for those traveling along this state and National Scenic Byway. The current Forest Plan assigns the corridor to a land use designation of Scenic Travel – Retention. The proposed Forest Plan Revision would maintain a similar management of scenic views. The USFS previously determined that the I-90 project with the Selected Snowshed is consistent with the Forest Plan. The Proposed Bridges differ from the Selected Snowshed in appearance and would require more alteration of the adjacent hillside forest. Adherence to the *Architectural Design Guidelines* (WSDOT 2008f) should ensure the Proposed Bridges are consistent with Forest Plan objectives.

Visual quality for travelers within the design modification area would improve. While in the Selected Snowshed, scenic views of mountains, lake and forest would be mostly blocked (WSDOT 2007b). For eastbound travelers on the Proposed Bridges, views of the adjacent hillside would be obscured by the higher westbound bridge, but westbound travelers would have unobstructed scenic views up and across the lake where none previously existed. For either option, the changes in traveler views are relatively brief (12.5 seconds) at the 65 mph design speed of the new roadway.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

WSDOT's strategy is to identify critical resources and modify the project design to avoid and minimize potential impacts where practicable.

The Proposed Bridges and the Selected Snowshed would use the Cascadian style design theme from the *Architectural Design Guidelines* (WSDOT 2008f), which WSDOT committed to using in the 2008 Final EIS. The Cascadian theme uses native rock, or the appearance of native stone texture, on walls, barriers, piers, and tunnel portals. The theme as applied by WSDOT may incorporate arches on the bridge piers and large tapered columns with rock texture and rock-patterned barriers. The consistent use of this design theme is intended to help unify the look of the I-90 corridor and improve the visual quality ratings from existing ratings.



Both options would use the Cascadian style design theme, which is being carried throughout the I-90 corridor.

Best Management Practices

WSDOT committed to a comprehensive list of BMPs in the 2008 Final EIS to meet applicable performance standards and address the impacts of the I-90 project with the Selected Snowshed (Appendix F). Construction of the Proposed Bridges would not change the commitment to these BMPs and no additional BMPs are currently required.

Compensatory Mitigation

Compensatory mitigation to address the impacts of the I-90 project with the Selected Snowshed is provided in Appendix F. No additional compensatory mitigation measures are expected for the Proposed Bridges.

3.10 Social and Economic Resources

This section discusses the potential impacts of each option on the local and regional economy. Social and economic impacts are expected to extend well beyond the design modification area. Therefore, the study area for social and economic resources includes Kittitas, King, and Pierce counties. Additional information is provided in the *Socioeconomics Technical Update* and *Public Services Technical Update* (Appendices N and O).

What has changed since the Record of Decision was issued?

There are no substantial changes to the affected environment as described in Section 3.13 of the 2008 Final EIS. However, cost estimates to construct the I-90 project have been updated since the ROD was issued based on more detailed design information.

How do the impacts of the Proposed Bridges compare with the Selected Snowshed?

Temporary Impacts

Employment Benefits

The I-90 project as a whole will create a substantial number of temporary construction-related jobs, including approximately 4,800

direct jobs and 7,300 indirect jobs (12,100 total jobs) over the life of the I-90 project.

Construction of the Proposed Bridges is anticipated to cost essentially the same as construction of the Selected Snowshed. Construction-related employment is directly proportional to cost. Therefore, the Proposed Bridges would not change the amount of direct labor income generated by the I-90 project. Employment benefits during construction are the same for either option.

Public Services

Highway closures and lane restrictions during construction have the potential to impact emergency services, but are necessary for construction of either option. The Proposed Bridges would require fewer highway closures than the Selected Snowshed, which would improve access for emergency services during construction.

Permanent Impacts

Employment Benefits

After construction is complete, operation and maintenance of the highway could have nominal effects on employment throughout the local region and Washington State. WSDOT maintenance staff for the existing I-90 corridor through Snoqualmie Pass consists of 25 full-time employees and an additional 45 seasonal employees during the winter months. WSDOT will need to hire additional maintenance staff for I-90 to accommodate the increased number of structures and to plow the additional lanes during the winter after construction of the I-90 project.

Both options would result in some maintenance benefits associated with reduced avalanches and rock fall. However, some additional maintenance is required to maintain both structures, as described in Section 2.5. The Selected Snowshed would require four additional staff to operate and maintain its electronic, lighting, and fire and life safety components, resulting in a slight increase in local employment. In contrast, the Proposed Bridges would not require additional maintenance personnel for the first 20 years. Additional staffing may be required once the bridge structures age and require repairs for potential bridge deck and joint problems.

Once built, the I-90 project with either option would have no impact on overall employment trends within the study area.



Construction of either option will create jobs in the I-90 project area.

Reliability Improvement Benefits

Closures of I-90 can result in costs to the regional economy because they interfere with commerce, disrupt travel, delay delivery of freight, and increase uncertainty for manufacturers and shippers. Closure-related impacts on commercial trucking operations may include violation of mandated curfew hours, increased overtime costs, and missed shipping connections. These are referred to as opportunity costs of road closure. The longer the closure, the faster opportunity costs accumulate.

Both options would require periodic lane closures for routine maintenance and inspection. Compared to the Selected Snowshed, the Proposed Bridges would require fewer lane closures for maintenance (see Section 2.5), resulting in lower opportunity costs.

Both options would reduce the frequency and duration of unexpected road closures due to typical avalanche events and rock fall, thereby lowering opportunity costs relative to existing conditions. Periodic lane closures may be required for active avalanche control and snow removal associated with extreme avalanches for either option (see Section 2.5).

Benefits to Public Services

The I-90 project with either option would improve traffic flow and transportation safety that would have a positive effect on emergency services response times. The Proposed Bridges would place fewer demands on emergency service providers than the Selected Snowshed because the Selected Snowshed requires specific training for a tunnel emergency response that would not be required for the Proposed Bridges.

How will FHWA and WSDOT mitigate for adverse environmental impacts?

Avoidance and Minimization

No avoidance or minimization measures have been proposed.

Best Management Practices

No BMP-related commitments were made in the 2008 Final EIS for the I-90 project with the Selected Snowshed, and none are proposed for the Proposed Bridges.

The **opportunity cost** of a weather-related closure of I-90 includes the value of passengers' and commercial drivers' time and costs to operate passenger vehicles or the loss of revenue for commercial trucks.



Freight trucks at a standstill on I-90 due to an avalanche control closure.

Compensatory Mitigation

Neither option would result in permanent adverse impacts to social and economic resources. Therefore, no compensatory mitigation is required.

3.11 Indirect Effects

Would the Proposed Bridges result in additional or different indirect effects?

The previous sections of this chapter evaluate the direct effects of the Proposed Bridges as compared to the direct effects of the Selected Snowshed. This section considers the potential indirect effects of constructing the Proposed Bridges. Additional detail is provided in the *Indirect Effects Technical Update* (Appendix P). The indirect effects of the I-90 project with the Selected Snowshed were identified in the 2008 Final EIS.

Indirect effects are effects that are caused by the project and are later in time or farther removed in distance, but are still reasonably foreseeable.

The 2008 Final EIS concluded that almost all of the adverse effects of the I-90 project are direct rather than indirect. This is based on (1) the location of the I-90 project being almost completely within the Okanogan-Wenatchee National Forest, which will prevent the I-90 project from leading to housing or traffic growth (development that may occur on sections of private land would adhere to zoning regulations and the Kittitas County Comprehensive Plan); and (2) the unavoidable adverse impacts of the I-90 project are limited to the area of construction and will not result in adverse impacts either away from the I-90 project area or later in time. Where indirect effects would occur, they would have a beneficial effect. The beneficial indirect effects of the I-90 project are described below.

- The increased level of safety and capacity from the new highway would have beneficial economic effects continuing for many years throughout the State of Washington.
- The I-90 project's ecological connectivity improvements would result in a gradual increase in wildlife gene flow from wildlife use of the new crossing structures between the North and South Cascades.
- Removal of barriers would allow for restoration of wetlands and aquatic habitat, more natural stream movement of fish and aquatic species, and more natural passage of groundwater.

- Increased hydrologic connectivity between groundwater and surface water at stream crossings would have a beneficial effect on water quality and habitat over many years.

None of these indirect effects are solely attributed to the Selected Snowshed. The Proposed Bridges would not result in any additional adverse indirect effects or modify the beneficial indirect effects anticipated from the I-90 project with the Selected Snowshed.

3.12 Cumulative Effects

Would the Proposed Bridges result in additional or different cumulative effects?

This section discusses the cumulative effects of the I-90 project with the Proposed Bridges compared to the Selected Snowshed.

Cumulative effects are evaluated within the context of past, present, and reasonably foreseeable future actions. Additional detail is provided in the *Cumulative Effects Technical Update* (Appendix Q).

The 2008 Final EIS considered potential cumulative effects on greenhouse gas emissions, wetlands, terrestrial habitat, and land use. Construction of the Proposed Bridges would not change the I-90 project's effects on greenhouse gas emissions or wetlands.

Therefore, the conclusion that there are no cumulative effects to these resources would not change. Land use and terrestrial habitat are analyzed for changes to cumulative effects that could result from the Proposed Bridges. The 2008 Final EIS identified 27 past, present, and reasonably foreseeable future actions at the time of publication. Two additional reasonably foreseeable projects have been identified since the ROD was issued: the Upper Yakima Restoration Project and the Keechelus to Kachess Pipeline.

Land Use

The 2008 Final EIS indicated that the greatest risk of a cumulative effect from land use comes from the possibility of re-zoning to higher development densities. However, it is assumed in the 2008 Final EIS that development on private land is consistent with current zoning. The I-90 project with either option would not change traffic demand or induce growth and is not expected to change land use.

Cumulative effects are the summation of impacts on a resource resulting from the proposed project, when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes these actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Both of the newly-identified reasonably-foreseeable future actions are consistent with current zoning and are not a driving factor for changes to zoning. The Upper Yakima Restoration Project would also protect forested areas from development.

The cumulative impacts of these actions on land use are, therefore, unchanged from those described in the 2008 Final EIS.

Terrestrial Resources

The overall I-90 project with either option would have beneficial effects to terrestrial species by providing crossing opportunities for animals to move north and south across the highway. This beneficial effect would occur by acquiring habitat preservation areas in the I-90 project area, by restoring wetland and riparian habitat in the I-90 project area, and by reducing wildlife mortality. One of the goals for the Upper Yakima Restoration Project is to improve terrestrial habitat. Therefore, it is assumed that only beneficial effects to habitat are expected from this restoration. An assessment of the effects to terrestrial habitat from the Keechelus to Kachess Pipeline is not available at this time. The pipeline would run through currently forested areas that are assumed to be impacted during construction and retained as an easement above the buried pipe. Evaluation of the I-90 project's impacts to terrestrial species and identification of potential mitigation would be required by the USFS.

While the I-90 project, the Proposed Bridges, and the Keechelus to Kachess Pipeline would contribute to a cumulative loss of forest habitat in the Snoqualmie Pass Adaptive Management Area, these additional adverse impacts are less than the overall beneficial effects of the I-90 project and the Upper Yakima Restoration Project, which include improved ecological connectivity, increased riparian habitat, increased preservation of mature forest in the area, and reduced wildlife mortality. Ongoing land management activities such as those promulgated in the *Snoqualmie Pass Adaptive Management Area Plan* (USFS and USFWS 1997) and the *Northwest Forest Plan* (USFS and Bureau of Land Management 1994) are also expected to increase the extent of late-successional forest available to terrestrial species.

3.13 Other Environmental Considerations

Irreversible and Irretrievable Commitment of Resources

NEPA regulations require environmental analyses to identify "...any irreversible and irretrievable commitments of resources, which would be involved in the proposed action should it be implemented." Section 3.17 of the 2008 Final EIS identified some resources impacted by the I-90 project that may involve a possible irreversible or irretrievable commitment. Potential changes to these commitments that would result from construction of the Proposed Bridges are described below.

- Widening and realigning the I-90 corridor would result in an irreversible commitment of land resources during the time period that the land is used for a highway. The Proposed Bridges would slightly increase the amount of land converted to a highway use (Appendix L).
- The energy consumed during construction of the I-90 project is an irreversible commitment of resources. The Proposed Bridges would not change the amount of energy consumed during construction as compared to the amount of energy consumed during construction of the Selected Snowshed (Appendix B [Letter to File for Energy Resources]).
- Road construction would use construction materials (cement, asphalt, etc.), which would require the irretrievable use of additional labor and natural resources. The 2008 Final EIS concluded that their use would not have any adverse impact upon continued availability of these resources, and the Proposed Bridges would not change this conclusion.
- The I-90 project would require a substantial one-time irretrievable expenditure of both state and federal funds. The Proposed Bridges would not require additional expenditures for design and construction, and would result in a long-term cost savings for operations and maintenance as compared to the Selected Snowshed.

Primary irreversible and irretrievable resource commitments may occur when: (1) resources are removed and cannot be replaced within a reasonable time frame (such as extinction of a threatened or endangered species), or (2) project completion will obstruct use of the resources (such as building over a cultural site).

Relationship Between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

Pursuant to NEPA regulations, an EIS must consider "...the relationship between short-term uses of man's environment, and the maintenance and enhancement of long-term productivity." Section 3.17 of the 2008 Final EIS evaluated the short-term benefits of the I-90 project compared to long-term productivity derived from not pursuing the I-90 project. These effects are described below, followed by potential changes related to the Proposed Bridges.

- Short-term effects of the I-90 project include localized disruptions, higher noise levels, increased air pollution, and rerouting of traffic during the construction period. These impacts are relatively inconsequential in the long term and would not be changed by the Proposed Bridges.
- The I-90 project would reduce long-term productivity in areas where habitat is used for highway expansion, new alignments, or road widening. The Proposed Bridges would further reduce long-term productivity due to the increased land area needed to construct the Proposed Bridges compared to the Selected Snowshed.
- The I-90 project would enhance long-term productivity through the creation of additional wildlife habitat and the connection of habitat areas that are presently separated. The Proposed Bridges would not change the proposed wildlife connectivity or the creation of additional habitat by the I-90 project with the Selected Snowshed.

FHWA and WSDOT concluded in the 2008 Final EIS that the beneficial effects to long-term productivity are more considerable than the negative impacts. The slight reduction in long-term productivity that occurs because the Proposed Bridges would convert a small amount of additional land to a transportation use would not change this overall conclusion. The I-90 project with either option is consistent with the maintenance and enhancement of the long-term productivity for the I-90 project area and Washington State.

Chapter 4 Consultation and Coordination

This chapter summarizes the public involvement activities that FHWA and WSDOT carried out as part of this environmental analysis, how the public can comment on this Draft Supplemental EIS, and WSDOT's consultation and coordination with federal and state agencies and potentially affected tribes.

4.1 How has the public been involved in the I-90 project?

Throughout the duration of I-90 project, WSDOT has included the public in the environmental impact analysis process. In July 2012, WSDOT prepared a Draft Communications Plan for the Phase 1C Cost Reduction Incentive Proposal process, including this Supplemental EIS. The plan identified the methods for communicating information with the public, which include:

- The I-90 project website:
www.wsdot.wa.gov/Projects/I90/SnoqualmiePassEast
- The I-90 email list-serve
- Social networking tools (Twitter, Flickr, Facebook)
- The toll-free telephone number: 1-888-535-0738
- Posting information on community calendars
- Media relations, including press releases and media events
- Press releases
- Newsletters
- Fact sheets and handouts
- Outreach booths (fairs, festivals, and farmers markets)
- Project tours
- Project presentations
- Partnerships (visitor and convention bureaus and chambers of commerce)
- Rest area displays

In June 2012, WSDOT prepared a newsletter that highlighted the status of each phase of the I-90 project. The newsletter included an insert that focused on the Supplemental EIS process. The newsletter was widely distributed by mail to over 4,000 people on the I-90 project mailing list, including agencies, tribes, and members of the public. It is available on the I-90 project website.

Issues and concerns related to the I-90 project have not changed since the 2008 ROD was issued. Therefore, WSDOT did not conduct additional scoping for this Supplemental EIS. This approach is consistent with 40 CFR 1502.9, which does not require public scoping for a Supplemental EIS. WSDOT will continue communications on the I-90 project through meetings and presentations and is seeking feedback on this Draft Supplemental EIS.

Draft Supplemental EIS Public Comment Period

This Draft Supplemental EIS or a flyer summarizing this Draft Supplemental EIS was distributed to over 4,000 agencies, libraries, and members of the public on the I-90 project mailing list. WSDOT also distributed copies of the Draft Supplemental EIS to public libraries and placed official public notices and invitations to comment in local and regional newspapers of record, on the I-90 project website, and in the I-90 project newsletter.

The 45-day public comment period began when FHWA published the Notice of Availability for this Draft Supplemental EIS in the *Federal Register*. The comment period is the best opportunity for the public to provide feedback to WSDOT on the content of this Draft Supplemental EIS. All substantive comments received during the public comment period will be addressed in the Final Supplemental EIS.

Please send written comments to:

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WSDOT South Central Region
P.O. Box 12560
Yakima, Washington 98909
smithjw@wsdot.wa.gov

Online:

www.wsdot.wa.gov/Projects/I90/SnoqualmiePassEast

A limited number of hard copies or CDs of the Draft Supplemental EIS may be obtained by contacting the WSDOT Environmental Manager (contact information noted above).

Public Hearings

During the comment period, WSDOT will host informal public hearings in Bellevue, Hyak, and Ellensburg, where the public is welcome to attend and learn about the I-90 project, ask questions, and give oral and written comments on the Draft Supplemental EIS. Fact sheets and displays will be available. A summary report will also be prepared after all three hearings have been completed.

- October 23 – Lewis Creek Visitors Center, Bellevue, Washington from 4-7 p.m.
- October 24 – Summit Inn, Snoqualmie Pass, Washington from 4-7 p.m.
- October 25 – Hal Holmes Community Center, Ellensburg, Washington from 4-7 p.m.

Notice of the public hearings was published in five local English print periodicals. To reach individuals of limited-English proficiency, the public notice was also published in Spanish and Mandarin in local Hispanic and Chinese newspapers. The flyer advertising the public hearings, which was sent to the I-90 project mailing list, also included statements in Spanish and Chinese that full translations of the public notice were available on the I-90 project website.

4.2 How have FHWA and WSDOT consulted with other agencies since the Record of Decision was issued?

Formal Consultation

Formal consultation is communication required by regulation that results in agency findings and project commitments. FHWA and WSDOT participated in formal consultation with other agencies throughout the I-90 project, which is described in detail in Section 6.2 of the 2008 Final EIS. Formal consultation specific to the Proposed Bridges is described in this section.

US Fish and Wildlife Service

Due to the potential for previously unconsidered impacts to listed species and critical habitat as a result of the Proposed Bridges, FHWA reinitiated consultation with the USFWS in October 2012. Consultation is expected to conclude prior to publication of the Final Supplemental EIS.

Washington State Department of Archaeology and Historic Preservation

WSDOT and DAHP developed a Memorandum of Agreement during preparation of the 2008 Final EIS to document mitigation measures for removal of the Existing Snowshed, which is listed on the NRHP. No other historic properties are located within the design modification area. Both structures occupy the same footprint along the shoreline of Keechelus Lake, in an area primarily underlain by bedrock. The Proposed Bridges would not increase the potential to affect archaeological resources. Therefore, formal consultation with DAHP is not required under Section 106 of the National Historic Preservation Act.

Informal Consultation

Informal consultation consists of staff-to-staff correspondence between agencies. WSDOT consulted informally with federal and state agencies, local jurisdictions, and tribal governments continuously from the beginning of the I-90 project, which is more fully described in Section 6.2 of the 2008 Final EIS. Informal consultation conducted for this Draft Supplemental EIS is described in this section.

I-90 Project Interdisciplinary Team

FHWA and WSDOT formed the I-90 project IDT as an advisory body to incorporate both relevant science and the concerns of agency stakeholders. The charter of the IDT is to provide technical expertise and consultation on issues such as design solutions, permitting, and mitigation. The IDT's role on the I-90 project is ongoing and the members meet on a bi-monthly basis to discuss the I-90 project and potential project changes. The Proposed Bridges have been discussed regularly at IDT meetings for the past year.

I-90 project IDT member agencies:

- Federal Highway Administration
- US Forest Service
- US Bureau of Reclamation
- National Oceanic and Atmospheric Administration Fisheries
- US Environmental Protection Agency
- US Fish and Wildlife Service
- US Army Corps of Engineers
- Washington State Parks and Recreation Commission
- Washington State Department of Ecology
- Washington Department of Fish and Wildlife
- Washington State Department of Transportation
- Kittitas County

United States Forest Service

The USFS is a cooperating agency and manages the vast majority of the land in the I-90 project area, including the land in the design modification area. USFS land management policies are an important part of the social and environmental contexts of the I-90 project.

The design modification area is located within the Okanogan-Wenatchee National Forest and along the shoreline of Keechelus Lake. When I-90 was built, the USFS granted FHWA an easement to use National Forest land for highway purposes. Constructing the I-90 project required an additional easement from the USFS for the use of 36.52 acres of federal land. In order to grant this request, the USFS had to determine that the I-90 project was consistent with its land management direction for the surrounding area. The USFS issued a consistency determination for the I-90 project with the Selected Snowshed on August 18, 2009 (Appendix A). The Proposed Bridges would require a modification to the existing easement.

The procedure for granting an easement modification is the same as described in the 2008 Final EIS. If FHWA and WSDOT accept the design modification based on the evaluation in this Supplemental EIS, the USFS will make a consistency determination for the Proposed Bridges after the ROD is issued, as part of the USFS plan review and approval process. The USFS will base the consistency determination on whether the Proposed Bridges meet the I-90 project purpose and need, as well as the standards and guidelines of relevant land management plans and programs, which include the following:

- The 1990 *Land and Resource Management Plan, Wenatchee National Forest* (USFS 1990);
- The 1994 *Northwest Forest Plan* (USFS and Bureau of Land Management 1994);
- The 1997 *Snoqualmie Pass Adaptive Management Area Plan* (USFS and USFWS 1997);
- USFS Watershed Analysis and Watershed Restoration requirements;
- Amendments to the *Northwest Forest Plan* from 2004 and 2005 covering Survey and Manage Species and invasive plants;
- USFS ACS objectives;
- USFS Riparian Reserves requirements; and

Section 1.13 of the 2008 Final EIS details the procedure for complying with the **USFS Riparian Reserves** requirements and **Aquatic Conservation Strategy objectives** and for processing a **land transfer** among USFS, FHWA, and WSDOT.

- National standards for transfers of federal land to FHWA and WSDOT for highway easements.

United States Bureau of Reclamation

The USBR is a cooperating agency and has jurisdiction over water in Keechelus Lake and land surrounding Keechelus Lake. USBR concurrence is required to place fill in the lake for construction of either the Selected Snowshed or Proposed Bridges. USBR also needs to review and concur with permits and approvals issued by the USFS for the Proposed Bridges. FHWA and WSDOT have consulted continuously with USBR on the I-90 project through bi-monthly IDT meetings.

4.3 How have FHWA and WSDOT consulted with tribes since the Record of Decision was issued?

Formal Consultation

WSDOT and DAHP developed a Memorandum of Agreement during preparation of the 2008 Final EIS to document mitigation measures for removal of the Existing Snowshed, which is listed on the NRHP. No other cultural resources, as defined under Section 106 of the National Historic Preservation Act, are located within the design modification area. Both structures occupy the same footprint along the shoreline of Keechelus Lake, resulting in minimal potential to encounter archaeological resources. Therefore, additional formal consultation with the tribes is not required given the ongoing informal consultation with the tribes.

Informal Consultation

Informal consultation consists of staff-to-staff contact between agencies. WSDOT consulted informally with tribal governments continuously from the beginning of the I-90 project, which is more fully described in Section 6.2 of the 2008 Final EIS. Informal consultation conducted for this Draft Supplemental EIS includes general updates on the Proposed Bridges during regular meetings on the I-90 project and other WSDOT projects. Specific presentations are also planned during the public comment period.

Chapter 5 References

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Chapter 6 Distribution List

A limited number of hard copies or CDs of this document are available free of charge, while supplies last. Contact information is shown in the Fact Sheet of this Draft Supplemental EIS.

Federal/State Agencies

National Oceanic and Atmospheric Administration

National Park Service

US Army Corps of Engineers

US Bureau of Reclamation

US Department of Interior – Fish and Wildlife Service

US Department of Transportation – Federal Highway Administration

US Environmental Protection Agency

US Forest Service

Washington State Attorney General

Washington State Department of Archaeology and Historic Preservation

Washington State Department of Ecology, Environmental Coordination Section

Washington State Department of Fish and Wildlife

Washington State Department of Natural Resources

Washington State Department of Transportation, Environmental Services Office

Washington State Department of Parks and Recreation

Washington State Parks and Recreation Commission

Washington State Transportation Commission

Local Agencies

Kittitas County

Tribes

Confederated Tribes of the Colville Nation

Muckleshoot Tribe

Snoqualmie Tribe

Tulalip Tribe

Wanapum Tribe

Yakama Nation

Libraries

Bellevue Regional Library

Central Washington University Library

Cle Elum Library

Ellensburg Public Library

Issaquah Library

Lake Hills Library

Newport Way Library

North Bend Library

Seattle Public Library

Washington State Library

Media

Ellensburg Daily Record

Issaquah/Sammamish Reporter

Daily Journal of Commerce

Bellevue Reporter

Northern Kittitas County Tribune

Other Organizations

Alpine Lakes Protection Society

Animal Advocates of the Inland Northwest

Audubon Washington

The Cascades Conservation Partnership

Forterra
Citizens for Scenic Views
Defenders of Wildlife
Habitat & Highways Campaign
I-90 Wildlife Bridges Coalition
In Defense of Animals
Kittitas Audubon Society
Kongsberger Ski Club
The Mountaineers
Mountains to Sound Greenway
The Nature Conservancy
Northwest Ecosystem Alliance
Paws
Point Defiance Zoo & Aquarium
Sierra Club – Cascade Chapter
Southern Rockies Ecosystem Alliance
Washington Alpine Club
Washington Environmental Council
Washington Public Ports Association
Washington Ski Touring Club
Washington State Snowmobilers Association
The Wildlife Society – Washington Chapter
Woodland Park Zoo

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Chapter 8 Glossary

Avalanche. A natural occurrence when accumulated snow, ice, and debris on a hillside falls rapidly down a slope.

Avalanche chute. The excavated paths that have been contoured to direct avalanches along a certain route.

Avalanche path. The natural route that an avalanche takes as it travels down a slope.

Best management practices (BMPs). Methods or techniques found to be the most effective, practical means of achieving an objective (such as preventing or reducing pollution).

Cost Reduction Incentive Proposal (CRIP). A means to promote innovative ideas involving improved work methods, new products, and improved equipment.

Cumulative effect. An effect on the environment that results from the incremental consequences of an action when added to other past, present, and reasonably foreseeable future actions.

Direct impact. An impact on the environment that is directly caused by an action.

Easement. The interest, permission, privilege, or right which one property owner grants another (usually that of a neighbor), for a specific, limited purpose.

Environment. The sum of all external conditions affecting the life, development, and survival of an organism.

Environmental impact statement (EIS). A document that identifies and analyzes, in detail, environmental impacts of a proposed action. As a tool for decision-making, the EIS describes positive and negative effects, and lists alternatives for an undertaking.

Impervious surface. Surface through which water cannot percolate (such as pavement).

Indirect effect. Effects that are caused by the project and are later in time or farther removed in distance, but are still reasonably foreseeable.

Intactness. The integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.

Jurisdiction. A municipal government agency, such as a city or county. As appropriate, the term “jurisdiction” also includes federal and state agencies and federally recognized tribes.

Jurisdictional waters. Aquatic and wetland features that are regulated by federal, state, and local agencies; and include both “waters of Washington State” and “waters of the US.”

Mitigation measures. Actions taken to reduce adverse effects on the environment, usually implemented under the State and/or National Environmental Policy Acts.

National Environmental Policy Act (NEPA). Federal legislation passed in 1970 as the Environmental Quality Improvement Act, which establishes an environmental review process prior to any action for all development projects or major planning studies that are federally funded or that involve a federal agency.

Opportunity cost. The value of resources that would otherwise be productively employed, including time.

Ordinary high water mark (OHWM). The highest level reached by a body of water that has been maintained for a sufficient period of time to leave evidence on the landscape.

Pollutant load. The quantity of a pollutant generated by a specific land area over a given period of time, typically one year.

Portal. The entrance to a structure.

Record of Decision (ROD). A document prepared by a federal agency presenting the basis for the decision reached after completion of the Final EIS, summarizing any mitigation measures that will be incorporated into the project and documenting any required Section 4(f) approval.

Riparian Reserves. A USFS land allocation classification, established in the Aquatic Conservation Strategy of the Northwest Forest Plan, that refers to the area located within an established buffer distance away from water bodies and wetlands.

Rock cut. Refers to the removal of rock material from a hillside using blasting or other means.

Shorelines. All of the water areas of the state, including reservoirs, and their associated wetlands, together with the lands underlying them, except shorelines:

- Of state-wide significance;
- On segments of streams upstream of a point where the mean annual flow is 20 cubic feet per second or less, and the wetlands associated with such upstream segments;
- On lakes less than 20 acres in size, and wetlands associated with such small lakes.

State Environmental Policy Act (SEPA). Washington State legislation passed in 1974, which establishes an environmental review process for all development projects and major planning studies prior to taking any action on these projects. SEPA permits early coordination to identify and mitigate any significant issues or impacts that may result from a project or study.

Stormwater. Precipitation that runs off impervious surfaces and enters drainage facilities that will convey and/or treat it.

Supplemental EIS. Prepared after either a Final EIS or Record of Decision has been issued and new environmental impacts that were not considered in the original EIS are discovered, requiring the lead agency to re-evaluate its initial decision and consider new alternatives to avoid or mitigate the new impacts.

Unity. The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony or intercompatibility between landscape elements.

Viaduct. A bridge for carrying a road or railroad over a valley or the like, consisting of a number of short spans.

Vividness. The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.

Wetland. Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetland buffer. The upland area surrounding wetlands that serves to moderate biological and physical alteration of the wetland. The buffer widths are determined by the local agency with jurisdiction.

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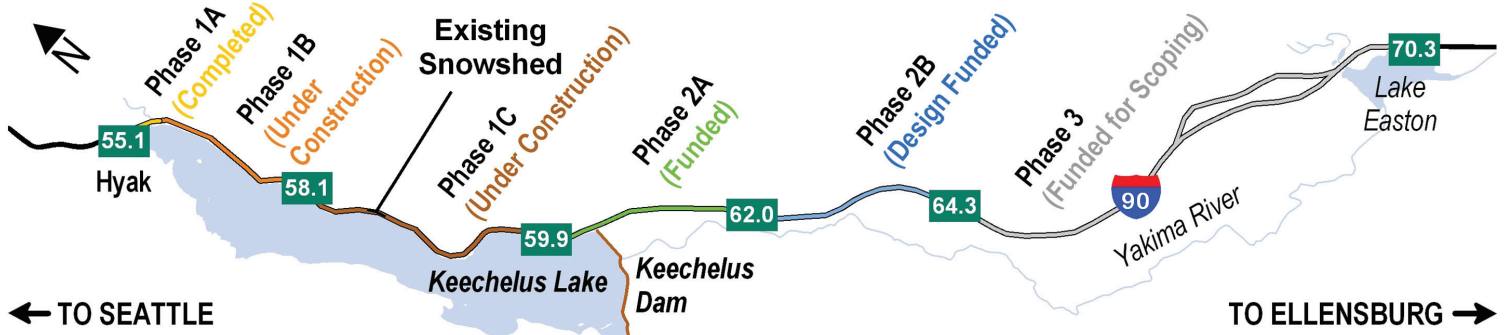
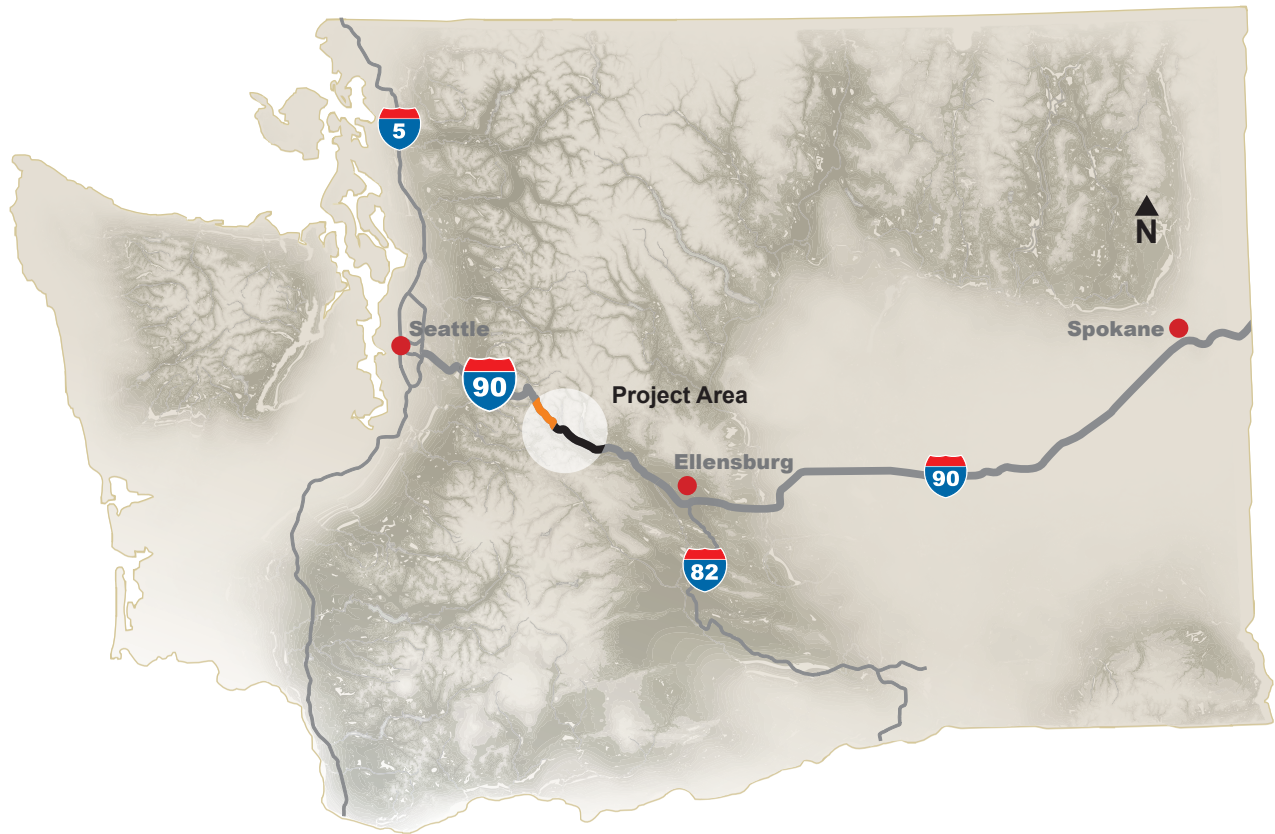
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Project Purpose:

To meet projected traffic demands, improve public safety, and meet the identified project needs in the 15-mile stretch of I-90 between the communities of Hyak and Easton in Kittitas County, Washington.

Project Needs:



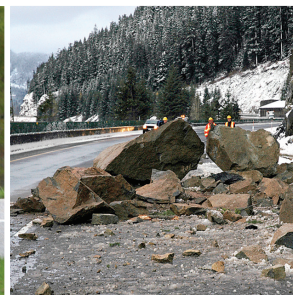
Avalanches



Traffic Volume



Habitat Connections



Slope Instability



Structural Deficiencies